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ABSTRACT

This report consists of three major sections. The first, a progress report for the period of 1983 to 1986 on the introduction of new information technologies into education among the member states of the Commission of European Communities, includes an overview of activities carried out in the member states and at the Community level, an appraisal of Community action, and a discussion of prospects for action at the Community level in 1986-1987. The second section reports on "CAL (Computer-Assisted Learning) for Europe," a colloquium devoted mainly to educational software, held in The Netherlands in May 1986. The third section reports on the third European university summer course on new information technologies held in Ghent from July 8 to 15, 1986, which focused on educational software as viewed from the perspective of educational practice. (GL)

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SOCIAL EUROPE

Developments in the introduction of new information technologies in education

SUPPLEMENT 2/87

COMMISSION OF THE EUROPEAN COMMUNITIES

DIRECTORATE-GENERAL FOR EMPLOYMENT,
SOCIAL AFFAIRS AND EDUCATION

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Under the terms of the Council Resolution of 19 September 1983 on the introduction of new information technologies into education (1), the Commission is required to submit to the Committee on Education and the Council reports on the progress made in this field both in the Member States and at Community level.

An overall report on the initiatives taken under the 1985-1987 work programme (2) will be drawn up in June 1988. An interim report covering the period 1983-1986 has just been submitted to the Committee on Education. This report consists of three parts : an overview of activities carried out in the Member States, an appraisal of Community action and the prospects for action at Community level in 1986-1987.

The first part amount to a conspectus of the national reports which the Member States have submitted to the Commission. The latter reports were drawn up by the national officials concerned with new technologies appointed by the Ministries of Education to the working party in charge of steering the Community action.
The second part describes and analyses the various European activities organized in the period 1983-1985.
The third part of the report sets out the Commission's future initiatives concerning the implementation of the work programme in 1987. These initiatives, which will focus primarily on educational software and the training of teachers, also constitute the start of the Commission's next work programme (1988-1992).

This report has been produced with the technical assistance of the Institute of Sociology of the Université Libre de Bruxelles. We thought it appropriate to print the report since, apart from the information it contains, it clearly illustrates the spectacular development recorded in all the Member States as regards the introduction of NIT into schools from the point of view of both the installation of equipment and the training of teachers as well as the production of educational software. In this connection, there is a very clear desire for cooperation between the Member States.

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(1) OJ No C 256 of 24 September 1983.

(2) Adopted by the Commission on 14 December 1984 (COM/84/722 final).

At the same time, European meetings at Community level have become more specialized and increasingly professional in character. In this respect, the European Colloquium held in the Netherlands in May 1986 on the subject "CAL FOR EUROPE" (3) was very clearly a turning point. Devoted mainly to educational software, the debates were far more technical in nature than had hitherto been the case. In particular, the participants broached the question of the educational software market. Duting the colloquium in Enschede, the participants clearly expressed their desire to move on to a cooperative and operational phase.

The colloquium was organized jointly by the Commission, the Netherlands authorities, the Twente Polytechnic and the COI (Centre for Education and Information Technologies). The final report on the colloquium was produced by Han van Gessel, a journalist on the Volkskrant.

The third European university summer course on NIT and education was held in Ghent from 8 to 15 July 1986. It was organized jointly by the Commission and the Belgian authorities in collaboration with the experimental teaching laboratories of the universities of Ghent and Liège. The topic chosen in this case was also that of educational software but approached from the point of view of educational practice. Some forty researchers from the twelve Member States studied the importance of software in schools and the bes methods for their use. On group dealt particularly with the training of teachers to use software and its introduction into curricula. Another topic discussed by the researchers was that of the analysis and description of software. During the summer course they therefore devised a grill for the description of educational software so as to lay the basis for a European analysis and classification of educational software. A glossary in the nine Community languages was also produced during the summer course containing the main terms used in respect of educational software. The final report on the summer course was produced by Professor Gilberte SCHUYTEN of the University of Ghent.

Lastly, following the success of the "Young People and New Technology" week held in Turin last year, "European Tours" were jointly organized by the Commission, the French authorities and the organization "Inter-Echanges". Some fifty young people of 16 to 18 years of age from the various Member States took part in these tours, the aim of which was to increase young people's awareness of scientific research and its developments.

Monique LEENS.

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(3) Computer-Assisted Learning.

REPORT ON PROGRESS MADE IN INTRODUCTION OF NIT IN EDUCATION SYSTEMS FROM 1983 TO 1986

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INTRODUCTION

The new information technology that is spreading rapidly across industry and the economic and social sectors has, to an increasing extent, become the driving force of our modern society.

The Community is aware of the need for and urgency of taking concerted action soon and is therefore getting mobilized.

The Commission has made the promotion of the competitivity of European industry the key to the general Community strategy and four[1] complementary projects — ESPRIT, RACE, BRITE and COMETT — are currently being implemented.

Human resources are of prime importance in this challenge to new information technology, as education and training in this field have to be very broadly based. The role of the school is considerable. It has to give young people a grounding whereby they can master and exploit NIT in their particular professions and enable them to adapt to this new technological culture in their everyday life.

Once trained in this way, young people will make an effective contribution to the development of NIT throughout the Community and throughout industry. The Commission is working towards these objectives with a variety of measures related to:

- vocational training and NIT (1985);
- cooperation between the universities and industry (1985);
- mobility (1985).

The Ministers for Education were anxious to give a Community dimension to NIT and so adopted a resolution on measures related to the introduction of new information technology in education (OJ n° 256 of 24 September 1983) on 19 September 1983.

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[1] - ESPRIT: European Strategic Programme for Research and Development in Information Technologies.
- BRITE: Basic Research in Industrial Technologies for Europe.
- RACE: Research in Advanced Communications for Europe.
- COMETT: Community in Education and Training for Technology.

The Ministers were particularly concerned with certain aspects of the inclusion of NIT in the teaching timetable:

- the aims and the methods of introducing young people to NIT;
- the application of NIT to the various subjects on the curriculum;
- the contribution of NIT to the education of children with special needs;
- girls' involvement in educational activity in which NIT plays a part;
- the essential links between school and vocational training.

The Commission has been invited to implement a number of schemes to introduce NIT by 31 December 1987. This will mainly involve collecting, exchanging and disseminating information about the introduction of NIT into schools in the Community and, in particular:

- running meeting programmes so that the Member States can pool their experience;
- setting up a programme of study visits aimed, as a matter of priority, at teacher trainers;
- instituting a specific NIT data exchange process (along the lines of the Eurydice network).

(a) The action programme

On 14 December 1984, the Community adopted an action programme[1] for the period 1985-87, in implementation of the resolution of 19 September 1983. This programme:

- lays down the areas in which the Community should intervene;
- specifies how the programme itself should be implemented;
- provides for a specific NIT information network to be established;
- suggests closer collaboration with the international organizations.

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[1] COM (84) 722 final.

This work programme focuses Community action on four main strategic topics:

1° the introduction of NIT in teaching methods and curricula;

2° training for teachers and teacher trainers;

3° software, courseware and hardware systems;

4° economic aspects and development strategies.

It lays down the various aspects to cover and action to be taken for each topic.

(b) Implementation of the work programme

A group of national leaders responsible for incorporating information technology into education has been set up to pilot the Community's action. These people are coordinating and planning the introduction of NIT into the education systems of their particular countries. They meet in Brussels periodically and the aim is to advise the Commission on the running and continuity of Community schemes and to help make for proper coordination of these schemes and any initiative taken in the Member States. The group also provides technical support for a coordinated motivation process with a view to getting the maximum from whatever action is taken.

The group played an active part in preparing the Community schemes since 1985:

- discussion of the programmes for the European seminars in Newcastle, Bologna, Berlin and Enschede. In particular, it was involved in forming the delegations for the seminars;
- discussion of programmes for the "Young people and NTI". Week in Turin (1985), the European tours (France 1986) and summer schools in Liège (July 1985) and Ghent (July 1985).
- organization (in collaboration with the national coordinators) of NIT study visits;
- definition of what prior studies were required;
- definition of priority schemes to be run in 1986.

The national leaders were also invited to produce national progress reports[1] on the incorporation of NIT in education since the resolution of 19 September 1983.

(c) Creation of a specialized NIT network: the Euryclée network

This comprises one or more centres in each Member State[2]. These centres are open to anyone interested in the incorporation of NIT in education, i.e. to people who spread their information (teacher trainers, inspectors, headmasters and headmistresses, teachers and students).

The aim is to select, store and exchange information (relating to the strategy applied in the particular Member State) on NIT incorporation in education with a view to enabling the different people involved in the educational process to familiarize themselves with new technology. The idea is also to find out about and ascertain the quality of existing courseware and to accede to any other courseware data banks in the Member States of the European Community.

The information centres are also intended to consolidate the Community activity envisaged as part of the work programmes by producing, say:

- dossiers for those benefitting from the study visits;
- information dossiers in preparation for seminars and meetings;
- a list of key people involved in NIT applied to education;
- the coordination of research.

They can get technical assistance from the Eurydice central unit with problems of educational data processing and documentation and with the production of dossiers in particular.

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[1] Annexes II - XIII

[2] Annex I.

Cooperation between the national Eurydice unit and the other centres will be defined and organized in the light of the specific characteristics of the education system in each Member State. The Commission invited the heads of the specialized centres to attend meetings of the group of national leaders and gives them the opportunity to meet the day before if they wish.

The first meeting of heads of centres took place in March 1986 with the aim of establishing priorities for data exchange within the network and defining the best way of organizing this exchange. With this in mind, a working party of heads of certain centres came up with an exploratory document on setting up a data exchange system between the specialized IT centres and education. This document includes, in particular, details of data exchange, the method of connecting up the various centres and an assessment of potential cost.

(d) Cooperation with international organizations

Cooperation with the national and international organizations that are active in the field of NIT and education took practical shape when representatives (of the OECD, the Council of Europe, UNESCO and IBI) attended the various European seminars in Marseilles, Newcastle, Bologna, Berlin and Enschede. These organizations also observe at meetings of the group of national leaders with a view to coordinating some of their own schemes and thus avoiding any duplication.

Lastly, the Commission gave financial support to a meeting which CERI (OECD) ran in 1984 to discuss the new duties of teachers and the implications as regards qualifications.

(e) The COMETT Programme - The universities and industry cooperate on training

On 5 December 1985, the Council adopted Commission proposals on a new action programme to boost cooperation between the universities and industry on training in new technology (COMETT)[1].

COMETT has three aims:

i to promote a European identity, in particular by encouraging students to take in-service courses in firms in other Member States;

ii to encourage economies of scale through the joint organization of new training programmes to remedy the shortage of specialized labour attendant on the speed of technological progress;

iii to encourage the Member States to exchange their experience on university-industry cooperation on training.

The Programme will provide Community support — an estimated 65 million ECU over the 1986-89 period — for schemes that pursue these objectives.

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[1] COM (85)431 : Action Programme of the Community in Education and Training for Technology.

(f) Progress report

In accordance with the resolution, the Community has to produce inter-Community progress reports and present them to the Education Committee and The Council of Ministers of Education. An overall report setting out the results of action taken in the Community and the Member States under the 1983-88 programme will be presented on 30 June 1988.

The report covers the period 1983-85/86 and is in three parts:

i a summary of activity in the Member States, based on national contributions[1] and drawn up by the national leaders;

ii an outline of Community action (details of schemes being run appear in Annex I);

iii prospects of Community action.

Each part covers the topics in the 1985-87 work programme.

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[1] Annexes II - XIII

I. SUMMARY OF ACTION BY MEMBER STATES TO INCORPORATE NITs INTO EDUCATION

In 1983, the Commission invited experts to produce national monographs as a basis for the Resolution and for the organization of the first European symposium in Marseilles. As this is such a rapidly developing field, in 1985 each member of the group was asked to update the monographs, setting out:

- a run-down of ongoing schemes and the strategies of which they are part;
- the laws and regulations defining the framework for schemes that are being or to be run;
- a summary of ongoing and completed research and study projects.

A. Introduction of NIT in educational practice and content

A.1. Measures taken

1° Public authority programmes

Considerable progress has been made with introducing NIT into education in most of the Member States over the past few years. Thanks to the MEP[1] for England, Wales and Northern Ireland and the SMDP[2] for Scotland, the UK already had substantial experience in this field in 1983 and has obtained more since then.

In most of the Member States, the introduction of NIT into education is now better structured and better use is made of the means available.

In July 1984, in Belgium (Dutch speaking) a ministerial committee on education and information technology was set up to advise representatives of the Cabinet of the Ministry of Education, the cabinets of the Flemish Community and the three teachers networks, the universities and the Belgian radio and television. The committee was appointed to define a suitable policy for the introduction of NIT in education (Dutch speaking).

Following the 1983 plan to introduce 100,000 microprocessors, France in 1985 drew up its "Computers for everyone" plan (PIPT).

In 1985, Spain devised the ATENEA experimental project relating to the development of NIT in non-university education.

Italy launched a national plan to introduce NIT into upper secondary school in October 1985.

In 1984 in the Netherlands an information promotion plan (INSP) was launched. It is a five-year promotional plan, of which teaching is one aspect. It concerns all sectors of education, except the university.

Following a pilot scheme conducted in 1984-85, Portugal introduced the national MINERVA programme[1] in October 1985. It is devised around five universities: Coimbra, Braga, Porto, Aveiro and Lisbon.

In the Federal Republic of Germany, the Joint Federal Government-Länder, Commission for educational planning and the promotion research (BLK) adopted a general programme on information technology in education and training on 7 December 1984.

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[1] Microelectronics Programme

[2] Scottish Microelectronics Development Programme

The BLK outline plan provides the basic guidelines for the introduction of NIT in education in the Länder of the Federal Republic. To encourage this, in 1984 the BLK established a policy encouraging pilot projects jointly financed by the Federal Government and the Länder.

In these Member States where teachers and head-teachers who had been converted to NIT first introduced measures in this field (which were rather piecemeal as a result), The public authorities and the training institutions have taken over and are, to an increasing extent, encouraging and managing the incorporation of NIT in education.

The authorities are now convinced of the need to introduce NIT into schools and are setting up reception strucutres, providing a framework of regulations and laying down guidelines where facilities should be sited. A certain degree of decentralization is being encouraged.

In the U.K., for example, the national authorities said that starting in 1984 the local education authorities (LEA) would take over the running of the Micro-electronic Programme (MEP), with continuing national backing.

In Belgium (French-speaking), the job of introducing NIT into education is basically done by the national authorities, but they have considerable support from the university OSE (Computers for Education) network, which has taken over the documentaiton, information and training of teachers.

In the Netherlands, heads of external projects are appointed in each education sector. They advise the Ministry of Education and Science on the launching of projects and are responsible for the follow-up.

2° More effective follow-up

Several Member States have made provision for national councils to monitor the introduction of NIT in schools.

In Belgium (Dutch speaking) under the Ministerial Committee on Education and Information Technology, seven working parties have been set up to prepare plans of action and to provide support.

In Denmark, since 1983, a ministerial committee on teaching NIT has examined the possibility of relating this subject to the other subjects taught in primary school.

In Ireland, a Curriculum and Examinations Board was established in 1984 to review the structure and content of programmes so that they could be better adapted to pupils' needs.

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[1] MINERVA - Moyens Informatique dans l'Enseignement: Rationalisation, Valorisation, Actualisation

In Italy, the Directorate-General for technical educaiton has introduced systematic assessment systems which are run by the research institutes and technical committees which prepared the draft reform.

In the Netherlands, the Centrum voor Onderwijs en Informatietechnologie (Centre for Information Technology and Education (COI) was a set up to stimulate the use of computers in schools. The COI collects and distributes documentaiton concerning NIT. It is also involved in various development projects in the framework of INSP.

In the Federal Republic of Germany, the BLK and the Standing Conference of Länd Ministers of Education deal with questions concerning the coordination and promotion of NIT in education. All the Länder have set up schools and other educational establishments in connection with NIT and teaching programmes. The Munich Institute for audio-visual media in science and education will now serve as a documentaiton centre to establish guidelines for the Länder and is available to them for consultation on any information problems that overlap between Länder.

3° Creation of bridges between industry and education

The fact that some Member States are creating institutional structures involving bridges between industry and education is also worth noting.

In French-speaking Belgium, for example, it is hoped, through the creation of the "Club Athéna Technologies-Education", to give education the benefit of the results of applied NIT research and to see that firms get staff who are better suited to new technological demands.

Teachers in Belgium (Dutch-speaking) have been abel to follow in firm training courses of 2, 4 or 8 months since 1982. One week courses have been organized since 1985/86 by the Vlaams Economisch Verbond with the support of the Ministry of Education (Dutch-speaking).

Italy has opened four inter-regional centres - CILEA (Segrata), CINECA (Bologna), CSATA (Bari) and SOGESTA (Urbino) - which will, in particular, provide a link between education and the software-materials production industry and the software publishing houses.

In the Netherlands, the NIVO project, which is associated with the country's main computer firms, has been set up to introduce NIT into lower, general and technical secondary schools starting in 1985.

The introduction of NIT in technical educaiton is a first priority. In nearly all sectors of technical education, projects have been launched to find ways of creating better links between education and the requirements of working life.

In the Federal Republic of Germany, on-the-job training courses and guidance are provided for pupils in Hauptschule and Realschule by computer firms and firms in commerce and banking with suitable equipment. This gives young people an opportunity to obtain a working knowledge of information technology.

4° Spread of NIT to all branches of education

Most Member States have started or are continuing to introduce NIT through their education systems.

Secondary education (lower and upper levels) - a rapidly expanding installation programme.

Most Member States have concentrated their efforts on the introduction of NIT in general secondary education, and the results have been very incouraging in most countries.

At primary level, provision has been made in Belgium (Dutch-speaking) to include introductory courses in NIT at all three levels of education. All schools will be equipped with the necessary material by 1990.

At secondary level, an introductory course in NIT is compulsory in state schools and subsidized schools.

A specialist NIT course is introduced as a compulsory subject in higher education in the non-state sector and as a supplementary subject in the state and subsidized sectors.

In Denmark, under new guidelines the aim is to include 30 hours of computer studies in the first year of general education. In the 1983/84 school year this course was given in 20 establishments.

In France, NIT is to be extended to all levels of education. When the 9th plan is completed in 1988, it is planned that NIT will have been introduced throughout the school system which will have more than 100,000 microprocessors at its disposal.

In Greece, a course in NIT will be introduced on an experimental basis in 1986 in lower secondary schools in the Athens and Piréa regions.

Starting in 1987/88, computer studies will be introduced in the first year of upper secondary school in the same region. 1988-91 it is planned to complete the introduction of NIT in all lower and upper secondary shcools in the country.

In Ireland, the programme to provide all secondary schools with microprocessors, which began in 1980, was completed in 1985 and now every schools has a complete microprocessing system and the relevant educational software. A further development programme to update the school equipment was implemented for 1985-86.

In the Netherlands, according to a inventory taken in 1985, 55% to 90% of general secondary schools possessed one or more computers.

Two projects to fit out the nation's secondary schools are also worth noting:

(a) The 100 school project

This is a first experiment to enable schools with no experience of teaching computer studies to familiarize themselves with NIT. This major project began in 1983 and a further 100-school project is being planned to back up and speed up the movement started by the first.

(b) The NIVO project[1]

At the request of Dutch computer manufacturers, this project has been introducing NIT in all general secondary and technical schools since 1983. The project reaches 2,250 schools.

In each school three teachers (at least one woman) attend special retraining courses. The software has been developed and each school is equipped with a network of 16-bit MS-DOS computers.

In Portugal, the experimental phase of the MINERVA project covers 1985-86 and mainly concerns some 50 secondary schools. Starting in 1988, the project will be gradually extended NIT to the whole secondary section.

In the U.K., there are on average 13 microprocessors per school, (one for every 95 pupils). Schools offering GCE A'levels[2] have considerably more computers. It appears that all secondary schools are currently familiar with the use of NIT.

NIT will be compulsory for all 9th and 10th grade students in the Grand Duchy as from the 1986-87 school year.

NIT is a subject which may be studied by students in the higher classes in Luxembourg.

NIT is developing fast in upper secondary education in most of the Member States.

Italy is planning to give all upper secondary schools a data-processing laboratory with eight to ten computers. There are also plans to build 150 local centres in the provinces to provide direct back-up for the schools and train the teachers. The number of centres will be brought up to 750, so that the whole country is covered later on. Note also the "Videotel school project" which can transmit educational and administrative data. This project has been running since 1984 in the Nistri lower secondary school and the Medici del Vascello Institute of technical studies, commerce and surveying. In 1985-86, it was decided to extend the equipment to 10 lower secondary schools and 22 institutes of technology in Rome. By 1986-87, Videotel should affect 200 schools.

In the Federal Republic of Germany, 85% of academic secondary schools and 50% of the Gesamtschulen have a computer. Equipment of the

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[1] New information technology in secondary education

Hauptschulen and the Realschulen differs considerably depending on the Länder, but is progressing rapidly.

Lastly, higher education in most of the Member States offers more or less complete courses in NIT in the form of first degrees in computer studies.

- Vocational secondary education- Computers are being phased in

  Much is being done in vocational secondary education to spread NIT to the various branches so as to provide the best response to the specific demands of industry with respect to training staff in new technology.

- Primary education - NIT introduced recently

  In most Member States, primary schools are still the weakest link in the chain when it comes to the introduction of NIT.

Generally speaking, the authorities are aware of the importance of introducing NIT at primary level, but progress varies from one country to another and is still slow.

The Minister for Education for French-speaking Belgium has come down in favour of introducing NIT into basic State education and thence throughout the education system.

In Belgium (Dutch-speaking) in depth studies have been carried out on a number of pilot schools at primary level and in special schools.

In Denmark, experiments have been conducted in the 8th and 9th years where computer studies are integrated with the teaching of arithmetic, mathematics, physics and geography. In the schools in Odense, an experimental programme deals with learning German by computer and the teaching of Danish as a foreign language.

In Ireland the Department of Education started a pilot programme in 1984 to evaluate the potential use and the efficiency of microprocessors in primary schools. An interim report was issued in 1985 and a final report is expected in 1986.

In Italy, the introduction of NIT in primary schools is still in the experimental stage. There have been many initiatives, but particular attention should be paid to the scheme run by Umbria and the inspectorates of Perugia and Terni. This involves 62 elementary school classes, a hundred or so teachers and 1,107 pupils. It will last another two years.

In Luxembourg, where education is bi-lingual, there is a high percentage of migrant children who are not yet fully integrated into the system and in view of the budgetary constraints, has not yet been generally introduced at primary level. This is only provisional, and steps ahve been taken to make NIT a compulsory part of basic teacher training for pre-school and primary level staff.

The Netherlands are bringing in experimental computer-backed courses in their basic and special teaching.

In the Federal Republic of Germany, general education provides a grounding in computer studies at secondary level. The introduction of NIT at primary level is not yet envisaged.

Thanks to the stimulus of the MEP and the SMDP, primary schools in the UK are very much involved with NIT and there are two computers for each primary school, on average, at the moment (one microprocessor for every 130 pupils).

Although most primary schools are still only teaching elementary techniques, the lessons tend to be stimulating.

A.2. Strategy

The strategy in the Member States is to spread NIT to the whole of the system of education in the long run.

In France, the "Computers for everyone" plan is aimed at: introducing pupils at every level of educaiton to computers as a tool, giving priority to pupils disadvantaged as regards their access to computers, opening computer workshops to everyone and training teams of teachers.

In the United Kingdom and Ireland, the main aims are to set up result assessment machinery in order to align school programmes with the latest technological developments.

Belgium, which has no hardware of its own, has opted for a deliberately slow start with NIT. The aim here is to cut down on the anarchic introduction of differernt computer equipment by feeding the education system all the available information on the capacity of hardware on the market, on the characteristics and limitations of existing computer languages, on the results of experience and on methods of producing courseware.

In the Federal Republic of Germany, the Länder agree that all pupils should receive basic training in NIT as part of their compulsory education. Training should include the acquisition of basic knowledge about the significance and possible uses of NIT, and the basic skills needed to use a computer to collect and process data.

B. Teacher training

At the European Symposia, the national leaders always insisted on the importance of teacher training, which they considered to be the key to any expansion of NIT in education. A number of teachers and head teachers have of course channelled their enthusiasm and their knowledge into helping NIT, but in the early 1980s most of them remained on the outside.

Since 1983 the Member States have made a huge effort to train teachers in NIT. Many teachers, however, feared they would lose their jobs or feared there would be a change in their traditional role as transmitters of knowledge. Since then, most teachers consider that following the introduction of NIT, there is no question of abondoning their teaching duties.

Many are currently attending training courses in NIT. Training needs are still largely unsatisfield.

There are three types of training:

- basic
- continuing
- teacher training.

Participants at the Bologna Symposium on training teachers in NIT on 7 May 1985 said that at least 10% of teachers in each school should have received specific training. All the Member States had not reached this percentage, but appreciable results had been achieved.

1° In-service training

Genuine progress has been made here. The initial effort was aimed at providing teachers with continuing training to get them used to using NIT in the classroom.

In Belgium (Dutch-speaking) teachers are given additional training of 30 hours to improve the integration of NIT in primary school. Secondary school teachers of computer studies receive initial and further training of 120 hours.

For other teachers, a course is planned in cooperation with the Belgian radio and television. Regional training centres are planned and in 1990 all teachers will have attended these courses.

France has set up 25 centres, one in each region, to provide training in NIT and its educational uses. Located in university environments, the centres receive teachers well placed to pass on what they have learned to teachers in the field. In 1985, nearly one quarter of the teachers were introduced to NIT and the practical use of equipment and software.

In the Federal Republic of Germany instructors were given training in information technology and data-processing in August 1983. Since that time, the majority of Länder have in addition included the new technologies in courses of study at Hochschulen (higher education institutes) and a subsequent period of practical training.

In the United Kingdom, about 80,000 teachers have been trained in the use of computers in education, an increase of nearly 50% over 1983. It is estimated that one third of secondary school teachers has already acquired an active basic knowledge of microprocessors.

In Ireland three levels of in service training courses are provided viz. elementary, intermediate and advanced. These courses are well-attended by teachers and a noted feature is the large percentage of female teachers who attend.For example in 1984 over 55 % of teachers who attended intermediate level courses were female.

In Portugal, the MINERVA project assumed the reponsibility in 1985-86 for training 1,000 teachers. From 1988, each year training will be provided as follows: 150 teacher trainers; 800 - 1,000 teachers who will be called upon to develop the use of NIT; 10,000 secondary user teachers and 7,000 primary user teachers per year.

2° Pre-service training - Now being introduced

Teacher training colleges in most of the Member States are now providing introductory courses in NIT in both primary and secondary schools. Plans have been made to start these for general and vocational education in 1986, as in Luxembourg, and some countries have them already.

Regardless of the efforts made and the spectacular results in some Member States, it has to be admitted that there are sill considerable shortcomings as far as teacher training is concerned, for the following reasons:

- there is still only a small number of teacher trainers;
- too much time goes by between the writing of the courses and their use in the classroom and this prevents enough teachers being trained in NIT;
- although the software is improving a lot, it is still not absolutely what is needed for the training courses.

For all these reasons, the authorities in most of the Member States began implementing various training schemes in 1985.

3° Training of instructors

New methods are being tried. With its NIVO project, the Netherlands has raised the number of instructors, in particular by calling on institutions outside education - TELEAC, for example, which runs the NIT courses for teachers with the close collaboration of the teacher training colleges.

In Belgium (Dutch-speaking) experienced teachers are trained in courses of two to eight months with the collaboration of the university. New experiments are under way.

With the NIVO project, the Netherlands has increased the number of instructors by allowing a number of them (about 40) to receive instruction in the latest developments of firms participating in the NIVO project. These 40 instructors in turn were able to train another 150 instructors so that they too would be able to give in-service training courses.

Soon, this group will give an introductory course to 7,000 secondary school teachers. For the time being, it is planned to provide basic training for about 90,000 secondary school teachers.

In Spain, teachers are trained at 78 teacher training centres (CEP) throughout the country. Teacher trainers receive intensive training at the ITE.

Italy has plans to train 700-1,000 teachers in 1985-86 to work in 100-150 schools (about 500 classes).

In the Federal Republic of Germany, some Länder have introduced intensive training courses for instructors who will pass on their knowledge. They are released from teaching one day a week over a long period of up to one year.

Further steps have also been taken in the United Kingdom to boost the already large number of instructors - 500 primary advisers and teachers have received advanced training and can now pass on their know-how to other teachers. The Open University has been asked to produce home study courses for all teachers who are not able to attend establishments where the training is offered.

Other types of training are also provided.

Some Member States, Italy for example, are also stressing the need to make head teachers aware of NIT and to train people to produce courseware with the help of computer firms.

Each Member State must of course take the high cost of this training into account.

In some countries, there is a need for Community action to generate reflexion on the objectives and, once these have been defined, on the content of the training courses to be offered.

This training process, whichever it is, will, of course, take a long time.

C. Software, courseware and hardware systems

None of the Member States has a dirigiste policy that would lead to software and hardware being standardized. Quite the contrary. They have all tended to encourage the proliferation of software as far as they can. This desire not to standardize has resulted, in particular, in the development of many small local and regional initiatives by teachers who, as they have done in Belgium (Dutch-speaking).

Ireland, the Netherlands, the Federal Republic of Germany and the United Kingdom, have grouped together to form associations and thus been called upon to join with the authorities to produce and assess the sort of software best suited to the various types of teaching.

In Belgium (Dutch-speaking) 65% of the software relates to secondary education, 25% to primary education and 10% to special education. Starting in 1990, an electronic data network will link all schools and will assist with the distribution and maintenance of courseware.

In some Member States, Belgium (French-speaking) and Luxembourg for example, no hard and fast choices have been made when it comes to the equipment needed in the initial stages of introducing NIT into primary schools. But the basic minimum has been laid down.

In France, FF 200 million was set aside for the purchase of software and in 1986 a further FF 40 million was set aside to equip lower and upper secondary schools. A software catalogue containing 700 items from France and abroad was circulated to all the schools and each establishment received at the same time as its hardware one or more collections of software.

In Spain, the school administration is developing as part of the ATENEA project communication systems for use between educationists, computer experts, software firms and editors with a view to improving their understanding of requirements, creating a programme bank and determining the nature of new software.

In Denmark, nearly 15% of primary schools have computer hardware. The software is mainly devised by the teachers without state subsidies. Projects exist to instruct the National Centre for Educational Resources (Landscentralen for Undervisningsmidler) to arrange for the diffusion of courseware to all schools.

In Ireland the Department of Education has operated a bulk purchasing scneme for the purchase of hardware and generic software for second level schools with a view to having an element of standarisation in both these areas. Schools however are free to purchase hardware and software from their own resources.

In other Member States, work has been based on years of experience and the results have been extremely interesting. In the United Kingdom, for example, there is almost three times as much software - around 3,000 units - now as there was in 1983. Every school in this country now has its own microprocessor and the relevant additional equipment.

The Netherlands has introduced a communal system of cooperation with the UK with a view to exchanging and possibly jointly producing courseware. The Netherlands can also consult the MEP and SDMP government project catalogues.

In the interests of better software production, the Netherlands and the Commission organized a symposium on the development of educational software in May 1986. This was an opportunity for the Member States to compare their experience and, above all, to pool the results of their research in this field.

Conclusions

Since the Council Resolution was adopted on 19 September 1983, the Member States have made a considerable effort with the introduction of NIT in education, teacher training, the production of software and the acquisition of equipment.

The situations of course vary from one country to the next, but each Member State is now resolutely tackling the job of introducing NIT into schools. Some countries have adopted a more reserved approach which will be equally effective in the long-term. Others, which have had more experience, have brought in regional and national plans providing a framework for the various educational establishments and institutions and are thus in a position to supply information, equipment and training programmes.

Although the Member States put the accent on general secondary education to begin with, all branches of education are now involved with NIT.

Since 1985 most of the Member States have concentrated on the production of educational software. The Enschede symposium and the Ghent summer school highlighted this tendency in the Member States. In this connection attention should be drawn to the increase in the number of cooperative projects in this field and the desire of the responsible authorities to organize an exchange of software as well as joint production.

II. STATUS OF COMMUNITY ACTION

a) European symposia

National situations were very different in 1983. All the Member States had incorporated NIT into their vocational secondary courses and most of them (with the exception of Greece and Italy) were trying to bring in introductory courses in higher education. Two of them, France and the UK, had embarked on vast national programmes to spread the use of computers and microprocessing equipment to all their schools at both primary and secondary level.

Spectacular progress was achieved with NIT introduction in the Member States over the 1983-85 period. And alongside this, as we shall see, the basic issues also changed.

The symposia held in Marseilles in December 1983, Newcastle in July 1984, Bologna in May 1985 and Berlin in November 1985 were the opportunity for their audiences, mainly decision-makers (representatives of Ministries and top civil servants from the Ministries of Education) and representatives from the world of education chosen because of their numerous contacts (inspectors and teacher trainers), to take stock of the progress made with introducing NIT into schools in the different Member States, to discuss the basic problems attached to incorporating NIT in education and to define common strategies for teacher training, data exchange and evaluation of software.

1° Marseilles symposium, December 1983

(The importance of NIT is understood)

Three months after the adoption of the Resolution (19 September 1983), the Commission, with the collaboration of the French authorities, organized the first European symposium. It was held in Marseilles on 7-9 December 1983 and the subject was information science and education (see the annex on Community activity, 1983-85).

The meeting was primarily an opportunity to survey the as then new field of NIT in education. Until then, the Member States had been left to their own devices and had to withstand the initial onslaughts of NIT on their own. Today we can see that the Marseilles symposium was, thanks to the Commission, the Member States' rude awakening to the importance of NIT and of the extent to which Europe was lagging behind, both technically and culturally, at that stage.

Before Marseilles there had been a general tendency to await new technological developments before making a better informed decision. But at Marseilles, all the delegates agreed on the urgent necessity of getting older secondary pupils familiar with NIT so they could obtain — in extremis — the basic knowhow.

Since then, and especially since the Newcastle meeting, NIT has begun to be introduced into the other areas of secondary teaching and plans are being made for the primary school too.

Delegates at Marseilles were aware of the importance of NIT and of the resistance of teaching staff to it and they highlighted the crisis in an education system which was cut off from the real world around it.

The subsequent development of NIT has accentuated this. Marseilles was an awakening to the scope of NIT and an opportunity to make the delegates aware of progress in NIT. But it also showed them that most of the Member States were lagging behind. Its merit is that it cleared the ground, marked out the path and outlined the problems of the moment.

Since then, the subjects of reflexion have changed, turning towards new centres of interest such as alterations to school syllabuses and timetables.

29. Newcastle symposium in July 1984

(Education incorporated into NIT)

NIT is becoming a vital teaching aid. The Newcastle meeting, which had the benefit of the experience of the UK (the organizer) in NIT, was held barely six months after the Marseilles symposium. The dates were 3-6 July 1984 and the subject was NIT in education.

Various equipment and software were brought to the symposium, so delegates had the opportunity of getting first-hand experience of NIT through modelling, word processing, data bases and various computer languages.

Newcastle was the first European symposium to stress the educational aspects of NIT, stating, in particular, that computers should not improve education but enable the pupils to organize their own learning[1].

As already emphasized, Newcastle agreed that NIT should be introduced into primary schools, as they were more flexible from the point of view of the timetables and syllabuses.

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[1] This was dealt with in greater detail at the summer school in Liège on 11-13 July 1985 when NIT in the learning process in the primary school and at the change-over from primary to secondary was discussed.

It also recognized that it was less important to teach pupils computer science as a subject than to get them to use computers in all subjects when they went to school. Delegates went counter to what had been said in Marseilles when they agreed that there was no point in making a distinction between good and bad software, as whether it was good or bad mainly depended on how the teacher used it [1]

Lastly, Newcastle clearly highlighted the fact that it was less important to change the structure, presentation and content of programmes than to make radical changes to teaching methods.

Delegates noted the various types of resistance teachers had to NIT. Some were worried about losing their jobs and others were ill at ease in the new role of learning manager in which they had to teach how to identify and process data rather than simply pass it on.

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[1] See the seminar on the development of educational software in the Netherlands on 26-28 May 1986, and at Ghent University (8-15 July 9186) devoted, in particular, to the use of NIT in schools.

3° Bologna symposium, May 1985

(NIT training for teachers must be intensified)

The Bologna symposium on NIT and teacher training (7-10 May 1985) dealt with the problems of the teachers.

Although the introduction of NIT in schools owes a lot to the enthusiasm and initiative of a certain number of teachers, Bologna also showed that we must be careful their enthusiasm does not wane and pay attention to the majority of teachers who are not involved in NIT.

The phenomenon is all the more acute in that teaching is always in a minority position in the overall process of information technology in society.

Bologna recommended overcoming these various handicaps by making all teachers familiar with NIT. This would start with an introductory phase followed by a continuation phase, with constant updating of knowledge. Although there is general agreement on the need for all teaching staff to have some basic training, there is still uncertainty when it comes to the method and content of the training. The general impression still seems to be that most of the countries involved are a long way from having proper plans or clear objectives in this field.

Delegates at Bologna said they wanted to provide structures whereby experienced teachers could collaborate candidly on the production of suitable software.

They seemed to agree that there should be permenent, local training units so teachers can apply to centres in their environment.

Although there are many important aspects of NIT to take into account, Bologna showed how great a concern teacher training should be, as teachers are one of the vital links in the teacher-taught chain. It comes as no surprise that one of the most important recommendations of the symposium was on running a detailed European study of the conditions of teachers and an analysis of the costs of training them.

4° Berlin symposium in November 1985: making NIT available to vocational education

The Berlin symposium which was held from 4 to 8 November 1985 demonstrated problems relating to the introduction of basic training in NIT for young people aged between 10 and 16 and between 16 and 19 years of age.

Divided between four working parties, the participantes studied the following topics:

- basic training in information technology in lower secondary school (10 to 16 year olds)

- training in information technology in upper secondary school (16 to 19 year olds)

- vocational training in information technology in the business and administrative management sector

- vocational training in information technologies in the industrial technology sector.

This symposium provided an opportunity for participants to familiarize themselves with pilot projects conducted in the Federal Republic of Germany and to visit enterprises, schools offering general education and vocational training centres.

Participants were also given the opportunity to examine a wide range of teaching material: teaching programmes, teaching units for an introduction to information technology, simulation exervises, videotext and computer-assisted learning software. The participants were able to appreciate the broad diversity of projects and products in the Federal Republic.

5° Enschede symposium in May 1986: the need for cooperation

Devoted to the development of educational software, the Enschede symposium organized in the Netherlands from 26 to 28 May 1986 was set in the context of CAL (computer assisted learning) for Europe. It dealt with four topics:

- computer assisted learning and the future development

- the concept of educational software

- the production of educational software

- the development of courseware and international cooperation.

The Enschede symposium was the first to be open to the new Member States, Portugal and Spain.

It emerged very clearly that the Enschede symposium was a turning point in the perception of NIT in education since the participants proved to be sufficiently advanced to go into greater, more technical, detail in their debates on NIT in education. This was due to the rapid strides made in a few years in the Member States' technological and cultural progress.

At the Enschede symposium, participants also broached the question of the market in educational software which is a particularly sensitive issue for the smaller Member States which produce neither hardware nor software. On this occasion, other partners, companies producing educational software and software publishers, who had until now remained on the fringe of the symposia had the opportunity to carry on a dialogue with the traditional partners in education. While not resolving the problem of the market, participants were at least able to discuss the subject and define the limits of their scope and influence.

The Enschede symposium also demonstrated the will of the participants to move from an operational phase so as to obtain concrete results and actual products.

Lastly, the papers and debates emphasized the need for cooperation between the Member States of the Community, while respecting the different cultural areas.

This cooperation, the principal feature of the Enschede symposium, would be given three directions as follows:

- realization of cooperative projects each involving a limited number of Member States, in the field of devising and producing courseware;
- dissemination of these achievements to all the Member States, taking account of the EURYCLEE network;
- organization of restricted meetings between Member States: working parties, mini-seminars etc. so as to identify more accurately the target groups of participants.

This cooperation was felt not only by each of the Member States but also by the Community to be a significant contribution.

b) Summer schools

The Commission has organized a number of summer schools with the help of some of the Member States. The aim is to encourage meetings between high-level educational research staff so they can find out about the work and experience of their European colleagues, combine what are all-too-often dispersed efforts and compare their points of view.

The Commission's action here is an essential contribution that is of considerable importance because it enables researchers to go in for profound, cooperative reflexion on precise, selected problems of education, going beyond passing fashions and tastes right to the root of the issue. It is an opportunity for researchers, who are often isolated and disseminated, to obtain information and discuss the latest results of their research.

1° The first summer school was run in Nice on 3-13 July 1984. It was organized with the collaboration of the French authorities. The subject was computer languages and their use in the classroom. The papers were of course very technical, but the important thing to remember is that the emphasis was on two basic computer languages:

- LISP, the oldest one, which dates back to the 60s. It is based on a mathematical structure and it gave rise to a whole family of LISt Processing languages that use lists as a basis for representing concepts and objects. The most important of these, which the researchers discussed, are small talk and logo which are used in many ways in primary schools.

- the more recent PROLOG (logical programming), a product of the 70s, which was designed as a specific answer to data processing problems close to natural language. This gave rise to other languages such as Micro-prolog and Dialog.

This meeting, the first of its kind, enabled researchers to investigate the implications and consequences of computer languages in education. The Nice summer school was, above all, an opportunity to clear the ground and lay the foundations for computer languages and highlight one or two of the problems of method and concept connected with their use in schools.

2° The second summer school the Commission ran, in conjunction with the Belgian authorities, was held in Liège on 4-13 July 1985. The subject covered was the introduction of information technology in primary schools and the meeting itself was jointly organized by the Universities of Liège and Ghent.

While the Nice topics were more technical and more general, those discussed in Liège were more specialized.

They were focused on the primary school and resolutely concerned with educational psychology.

The researchers in this case were more interested in the teaching and learning processes than in the outcome and they methodically presented their results, the hypothese behind their research and their initial scientific investigations in the matter of introducing NIT in schools.

Rather than deal with immediate effects, they stressed the problems and questions which, in spite of appearances, have not always had satisfactory answers.

Lastly, the Liège meeting produced a number of recommendations and, in particular, to:

a. increase small-scale research projects on which teachers and researchers can join forces. The results of this should then be spread over a wider field;

b. set up an interest group on the creation of material that is just as exciting and open-ended as logo, but with different content (history, geography or languages, say).

c. research into the possible contribution of programming to primary education is a fundamental, but it is rare and often inconclusive at the moment. So the meeting recommended developing this kind of research so as to obtain clear, specific information for teachers seeking aims and the relevant methods of achieving them.

3° The third summer school was organized by the Commission in cooperation with the Belgian authorities. It took place at Ghent University on 8-15 July 1986 to discuss how to use educational software.

It was organized in collaboration with Ghent and Liège Universities. Ghent University undertook to study four topics of research:

- Analysis and description of software
  - . preparation of descriptive analysis
  - . search for descriptive categories
  - . ways of using educational software
- Methodology: identification of specific teaching and learning strategies which could be assisted by this software
  - . structural aspect: highlighting organizational problems at school
  - . introductory and in-service training of teachers in the use of software
  - . evaluation of the introduction software in the education process.

In addition to the researchers, the Commission had invited the heads of the EURYCLEE centres to facilitate the supply and dissemination of information.

The four topics were discussed in plenary meeting and by the working groups and gave rise to four reports. One of the topics of research that was emphasized was the analysis and description of software.

In this context the researchers sought to arrive at an anlysis of software which could be used by teachers in the various Member States. Thus, they drew up a table for the description of software as an aid to establishing a European system of analysis and classification of educational software, and the presentation of a glossary in nine languages containing the main educational software terms.

The table of description of software covers 4 areas of analysis[1].

1. General description
    - 1.1 Identification
    - 1.2 Population, objectives, content
    - 1.3 Origin
    - 1.4 Documentation
2. Technical features
    - 2.1 Necessary material
    - 2.2 Environment
    - 2.3 Adaptability / Transportability
    - 2.4 Menus
3. Educational features
    - 3.1 Educational goals
    - 3.2 Educational significance
    - 3.3 Educational strategy
    - 3.4 Pupil activity
    - 3.5 Aid and adaptability for the pupil
    - 3.6 Aid and adaptability for the teacher
    - 3.7 Quality control
    - 3.8 Educational environment.
4. Supplementary information
    - 4.1 Experimental sheets
    - 4.2 Users' sheets
    - 4.3 Evaluation sheets
    - 4.4 Bibliographical references

The third summer school which is an extension of the Enschede symposium on the development of educational software has thrown new light on the use of educational software and gave rise to products that serve as useful tools for teachers in the European Community.

c) Young people and NIT weeks

1° "Young people and NIT" week in Turin, July 1985

This European event was organized by ENAIP, the Piedmont region, the province and commune of Turin with the help of the CSI

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[1] Only the main chapter headings are listed

(a computer consortium), Fiat, the Agnelli Foundation, the Turin Polytechnic and the collaboration of the Commission of the European Communities. The aim was to offer young people a broad picture of how NIT is used in industry and promote International Youth Year. The 150 young people who attended were aged between 15 and 18 and came from schools in the 10 Member States, the European Schools and the Piedmont area. They were selected by the Ministries of Education in each of the Member States and in some cases, national competitions were run to choose them.

Computer workshops were run by the CSI, Fiat and the Turin Polytechnic. So the youngsters had the opportunity to attend sessions on graphics (air quality control), cartography (screening weather maps of Europe and the Piedmont area), using interactive graphic instruments to produce a model car and using a personal computer to produce small training courses. They also visited firms and were thus able to see the latest progress in integrating NIT in the Italian business sector (optical fibre factories, inter-plant video libraries, electronic means of controlling looms etc).

There were cultural and leisure activities in addition to this heavy work programme.

2° European Tours (July 1986)

In 1986, the Commission of the European Communities promoted the organization of European tours in France for school children from the Member States in cooperation with the office for information, communication and scientific and technical education (DIXIT) of the Ministry for Research and Higher Education (MRES).

The aim of the European tours was to:

- make young people aware of scientific research, introduce them to careers in research, discover the specific features, facilitate access to experiments and topics associated with new technology;

- devlop and enhance the feeling of belonging to a European Community.

Inter Echanges organized two European tours on 4-12 July in France for about 100 16 to 17 year olds who were accompanied by scientists and interpreters.

Participants first met in Paris where they visited a large science museum and in the science and industry park, the "Geode" science complex and its giant spherical cinema, the Palace of Discovery and the magnificent planetarium, the "Commissariat à l'énergie atomique" at Saclay and the National Saturn Laboratory set up around the new Saturn cyclotron.

Participants were then divided into two groups, one visiting the Rhône-Alps and Côte d'Azur region, and the other the Normandy, Brittany and the Val du Loire.

(a) Rhône-Alps, Côte d'Azur

The young people had an opportunity to visit "Solems" at Palaiseau, the only European firm producing solar cells on an industrial scale, the Elf Acquitaine, Rhône Poulenc, Institute Max Von Laue - Paul Longevin, the National Studies and Telecommunications Centre, the Electronic and Information Technology Laboratory in Grenoble and the Sofia Antipoles science complex in Nice where there are 120 firms and a research centre forming the largest industrial part in Western Europe. Participants were also invited to visit historic sites on the Côte d'Azur, particularly Vallauris, St. Paul de Vence and the Maeght Foundation.

(b) Normandy, Brittany and the Val de Loire

Young people on the second European Tour visited the Dassault company at St. Cloud, the Electro-nuclear centre at Flamanville where the first nuclear chain reaction was recorded in 1985, Mont St. Michel, the national wind energy testing centre in Lannion where experiments concern radio telephone stations and meteorological observatories, the Pleumeur Bodu site which since 1962 has housed the telecommunications satellite station and the EDF power station at Chinon. This tour of discovery was completed by a visit to the Loire Châteaux.

Both European tours were a great success with the young people who were thus introduced to the most recent technology. The young people were entertained in the evening and took part in lively discussions.

d) Study visits

Implementation of the Resolution on the introduction of NIT in education entailed the organization for the first time in the 1984-85 academic year with the Educational Exchange Service (PAD) of the Standing conference of Länd Ministers of Education in the Federal Republic of Germany.

46 grants were awarded for study visits to the United Kingdom and France. This was the first attempt and numbers were deliberately restricted, but in view of the interest shown by participants, more grants will be awarded and the visits will gradually be extended to all the Member States.

One of the aims of the study visits is to have a multiplier effect - i.e. participants can pass on the fruits of their experience to other people, thus creating a large number of contacts and a network of relations.

The participants felt that, at European level, NIT could provide the technical support for better cultural communication beyond the national frontiers and linguistic boundaries, thereby encouraging better cooperation between the European citizens of the various Member States.

It clearly emerged that NIT is an excellent subject for study visits in that it:

- is of capital importance in education;
- covers a number of specialized fields, such as:

- equal opportunity;
- cultural handicaps;
- the transition between school and work;
- general education and training;

- involves joint efforts.

European cooperation can crystallize round NIT. This is something which very clearly emerged from the participants' reports. NIT can contribute to a better European conscience not just in the minds of the educators and specialists, but above all in the minds of the students. School is ultimately the only institution which involves the whole of the younger generation, that essential factor in the development of Europe.

So, going beyond a simple technical exchange of information, NIT study visits are, in spite of all obstacles, likely considerably to broaden the cultural horizons of those who take part and thus to change their outlook too.

e) Studies on NIT in education run for the Commission (DG V)

For several years now, the Commission has asked for studies outlining, inventorying or producing comparative analyses of NIT-related subjects to be produced. We present one or two studies, in chronological order, here by way of illustration. An exhaustive list is set out in annex I.

1° Education and microprocessing - two European strategies

This covers the UK and France. It was written by Catherine Chrétien and François Michel for the Agence Nationale pour le développement de l'éducation permanente". It is in two volumes and was printed in Paris in 1982.

The study describes NIT policies in the education systems in the UK and France and summarizes the important aspects of the measures implemented. Volume two contains a documentary based on a selection of documents collected during local trips. The important thing is that each of the strategies developed in these two countries is reflected more in the coherence and traditions of their education systems than in the incorporation of NIT.

Another important finding is that the budgetary problems are a worry because current operating budgets do not appear anywhere. At best the outlay on equipment can be traced, but the running costs can never be found with any precision.

2° Information technology in education and vocational training in the European Community

This was produced by the Council for Educational Technology for the United Kingdom. It is in two volumes and came out in 1982.

The study starts with an analytical description of the provisions introduced to foster exchanges of information on NIT in education and training at national level (see volume II) and Community level (Eurydice, Cedefop, Diane-Euronet) and at international level (Council of Europe, EIB, OECD).

The authors clearly state that none of the countries studied yet have a precise, exhaustive system of data collection.

They then go on to deal with the exchange of computer packages within each Member State and between the Member States.

An action programme and 20 or so recommendations have been sent to the Commission with a view to accelerating exchange on NIT.

3° New Information Technology and its impact on the science curricula in secondary schools in the United Kingdom

This was produced by Dundee College of Education in 1983.

The study starts with a description of the educational systems in the UK and then analyses a number of subjects on the basis of a questionnaire which 30% of the sample answered and which represents 10% of all schools in the UK.

The subjects focus on:

(a) changes in the curriculum and course content;

(b) the role of the computer in the classroom (simulation, experimentation, networks);

(c) basic and continuing training for teachers;

(d) remote software (telex texts, videotexts).

Various conclusions and recommendations complete the study.

4° The effect of data processing on scientific subjects in secondary schools in France

This was produced by the Institut national de recherche pédagogique in 1983.

This was undertaken at the same time as the Dundee College study. It deals with the effect information technology has on natural science, physical science and mathematics.

It emerges from the study that, in spite of considerable efforts, computers are not yet in ordinary use because most teachers are only beginning to discover NIT. This has nothing to do with the technical possibilities of the field or its educational potential.

The study ends with various prospects and a number of suggestions about avenues to explore in the field of adult education, equipment and software.

5° Higher education, industry and new information technology

This was written by Ladislav Servych for the Institut européen d'éducation et de politique sociale. It is in two volumes and came out in 1984.

The study quotes examples from France, the Netherlands, Germany and the UK. The analysis is along three lines:

(a) the extent and nature of high level NIT training requirements and collaboration between higher education and industry;

(b) the weaknesses and drawbacks of European systems of higher education — the considerable shortage of equipment and software, the blatant inadequacy of qualified staff and the isolation and inadequacy of research;

(c) permanent education and, most importantly, exchanges between higher education and industry — the two principal strategies for the vital development of NIT training.

Lastly, the study makes proposals for practical action at Community level.

Volume two deals with three particular aspects of the question — unlike the commonest methods, these studies do not look at the situation or trends prevailing in any given system (national case studies). The aim in this case is to make a more advanced and therefore more technical investigation of the effect of NIT on training in the two "most exposed" areas — engineering (annex I) and management (annex II). The third study, which is even more specialized, deals with the course in computer engineering offered by the Technological University of Compiègne in France (annex III).

6° Teaching and training the handicapped through the new information technology

This is by Jorgen Hansen. It was produced by the Official Publications Office of the European Communities in 1984.

The idea here is to give an overall view of teaching and training for the handicapped through NIT. It refers to certain schemes run in Belgium, Denmark and the UK. The author has the originality of providing a working definition of "handicapped", which is a long way from cerebral, motor and sensorial inadequacies.

He highlights the common handicap — a barrier to communication between the subject and his environment and vice versa. NIT is of major interest here as a means of communication, in particular via the voice, touch, reading, sound etc.

It is also envisaged as a means of vocational training.

National and international proposals on NIT in special education point the way to further developments in this field.

f). Subsidies

Subsidies have been awarded for European-type projects (symposia in the main) that echo subjects in the work programme. The Commission's limited budget for 1984 and 1985, however, has meant that not many projects could be supported.

III. PROSPECTS

1. This programme of activites is to complete the Work Programme for 1985-1987 (COM(84) 722 final) which implements the Council Resolution of 19.9.1983.

2. One outcome of the activities should be recommendations for a work programme for 1988 to 1991. The approach outlined here for the next eighteen months leads directly to their selection.

Activities for 1986-1987

3. Consolidation of existing achievements and the flow of information

   - The responsible national officials will continue to meet regularly in Brussels to maintain the flow of information exchanges at national and Community level, coordinate Community action and advise the Commission departments on the progress of and follow up to this action.

   - The heads of the centres in the EURYCLEE network will meet regularly to define the harmonized products which the network will supply. A brochure presenting the centres in the network will be published in the course of 1986 with the technical assistance of the EURYDICE European Unit. A list identifying the most important innovators in the field of NITs and education will be compiled and regularly updated. The network will also provide a regularly updated list of national conferences, seminars and exhibitions taking place. The possibility of introducing an electronic mail system to speed up exchanges and strengthen cooperation between centres will be examined. Finally, national reports on the introduction of NITs in education will be regularly updated by the centres.

   - Increasing exchanges and cooperation with international organizations.

   - Exchanges of information between teacher trainers.

4. Theme for 1986-1987

   The topic stimulating most interest in Member States at present is software development, and this will be the theme for the work during the next eighteen months. As it was the topic of the Netherlands seminar and the Summer Unviersity in Gent, it has been launched from a generally accepted background. Software development should be approached, not as the production of a number of independent items, but with full integration into the curriculum being taken into account. Other themes to follow include software dissemination, communication and the impact on primary schools. It is not envisaged that any theme will be exhausted within its particular time-span, but that initiatives will have been started that cen be continued both through this Programme and other support.

5. The activites and projects will be associated with this theme, approached from the four points of view identified in the 'Work Programme'.

- A. the introduction of NITs in teaching practices and curricula,

- B. training of teachers and teacher training,

- C. software, courseware and equipment systems,

- D. the economic aspects.

In addition, implementaiton involves activities and measures by governments of Member States to ensure that the introduction of NITs is realized on a broader scale in education.

6. Criteria

The criteria behind the identificaiton and practice of the activities should include the following:

- the activity should involve a minimum of three Member States

- the activity should lead towards further and widespread collaborative work between the Memebr States

- the work within the activity should ebenfit from added value derived from the European dimension

- the outcomes should be formative and helpful throughout Europe

- the activities should relate to and involve practitioners as far as possible.

7. Each activity should be followed up and developed as far as practicable. Any lessons learned should be disseminated with as much publicity as appropriate in each Member State. The EURYCLEE network will assist in this, and in interlinking the projects with each other.

8. Areas of Work

To promote the theme of software development, work will take place in the following areas:

a) Preparing the ground

- taking into account the need to exchange software and to foster joint development between countries, a report, involving evidence from all Member States, will be prepared describing the level of of cooperation that is practical between the states and identification of the problems to be overcome.

- a model will be developed to foster the exchange of experience concerning the development and application of computer based teaching materials. This will take into account the relevant cultural similarities and common perspectives between Member States. Particular attention will be paid to the promotion of greater equality of educational opportunity for girls.

b) Collaborative development

To further stimulate cooperative activity, three types of software development projects will be promoted:

- two projects will take place, each involving three or four Member States, which will involve collaborative development of software. Each group of Member States will work together to develop materials, taking account of their integration into the curriculum and classroom practice.

- the Community will call together seminars to prepare specifications and outline programmes through the following strategy. Each Member State will provide a team of four, a teacher trainer, curriculum developer, charismatic teacher and administrator, and these will meet together in two seminars of six countries each to debate and prepare packages in outline. The target will be carefully specified beforehand by the Commission, and it is hoped that each Member State will encourage final production of the items identified. During the seminars, probably of five days duration, the exchanges of working practice procedures will encourage wider understanding and help to stimulate greater breadth of approach.

- a seminar for individuals from each Member State will be held to develop ideas into draft programmes, including the use of tools, in a collaborative atmosphere. These can be further developed in the home state. The aim here is to spread general skills among those who are relatively new to programme development.

Topics for development will be agreed with each project, but attention should be paid to software for children with special needs, and also to that aimed at ensuring equality of educational opportunity for girls.

In all these activities, one of the outcomes will be the identification of problems that inhibit exchange of programmes between Member States and collaborative development, and the Commission will prepare a document outlining these issues on completion of these projects and seminars.

c) The needs of teacher trainers

A three-day seminar will be held to examine the teacher training requirements associated with computer software. This will be carefully targeted on teachers and teacher trainers, relating to specific and typical materials from each Member State, and producing a report identifying a range of particular approaches and tactics adopted, and their characteristics. The final outcome will be a document providing specific recommendations for software developers.

d) Sharing classroom experience

- two seminars for teachers will be held to explore different ways in which software is used. The objective will be to share experiences, identify needs for the software, and identify means of encouraging further exchanges between teachers in Member States.

The two topics will be the use of wordprocessing with 13 and 14 year olds in non-vocational lessons, and the use of databases in science teaching with children of similar ages. In each seminar, each Member State will be asked to send three teachers, preferably those who can act as multipliers within their own countries. Member States may like to provide videos of the teachers at work to illuminate the presentations. The Commission will provide a report of the seminars.

- the current experience of primary teachers in using software will be the subject of an investigation in Member States. Particular attention will be paid to the identification of common problems.

- two reports will be prepared, each identifying interesting experiences and practice in the use of software in the classroom. One will concentrate on Science, the other on Human Sciences.

e) Visits

- the exchange study visits during this period will be for software developers, and be aimed at visits to sites where development is taking place to explore procedures, tactics and strategies.

- three tours by young people will take place, helping them to share experiences and identify the use of information technology in each others education.

f) Technical problems

- one major issue inhibiting exchange and collaboration is the translation problem, encompassing both computer and national languages. This will be approached in the following way:

- a forum of experts, one from each Member State, will meet to identify the computer language and operating system issues. A feature of the outcome of this forum will be the costs involved in adopting a range of strategies. Attention will be paid to problems of portability and distribution of software.

- a selection of six programmes, not generic or content free, will be identified by the Commission in consultation with the Member States, and a number of countries will be invited to translate them for use in their own schools. A very careful analysis of the procedures, strategies and costs will be undertaken, the final report from the exercise providing guidelines and recommendations for future activities.

g) Evaluation of software

The Commission will collect evidence from each Member State on the different approaches and criteria adopted for software evaluation. These will be collated and a possible Community approach will be prepared for appraisal by each Member State.

h) Follow-up

During and after each of the activities and projects outlined above, the Commission will support such follow-up work and meetings as are necessary to draw out the practical benefits for further tasks and for the information of Member States.

i) Presentation of reports

At the end of 1987, a seminar for decision makers, experts and practitioners will be held to receive the reports of all the projects outlined above. These will be accompanied by a very specific list of recommendations which Member States will be invited to agree and implement in their own countries.

9. Forecasting the Future

The Commission will arrange for an occasional exchange of views between national experts on future technical and educational developments and their impact on education in schools. Papers from these exchanges will be provided to Member States to illuminate their decision making.

10. Other EEC activities

The Commission will prepare papers outlining the implications of other EEC initiatives that relate to or have a bearing on this Work Programme. Personal reports will continue to be made at the biennial meetings of those with national responsibility.

ANNEX

Community action

1. List of national policy coordinators
2. List of specialized centres
3. European meetings
4. Studies

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LIST OF SPECIALIZED CENTRES

ANNEXE I.B.

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ANNEX I.C - COMMUNITY ACTION

Year	Period	Type of activity	Place	Topic
1983	7-9.12	Symposium	Marseilles	Teaching computer studies
1984	3-6.6	Symposium	Newcastle	NIT - Teaching applie computer languages and their use in education
	5-13.7	Summer school	Nice	
1985	7-10.5	Symposium	Bologna	NIT and Education teacher training
	4-8.11	Symposium	Berlin	NIT in technical and vocational education
	4-13.7	Summer school	Liège	introduction of NIT in primary school
	11.2	Study visits	France, UK	
	10-11.10	Youth week	Turin	NIT and new industries
1986	26-28.5	Symposium	Enschede	development of educa. software
	8-15.7	Summer school	Ghent	analysis, methods and evaluation of the educational process when introducing courseware in school
	4-13.7	Youth week	France Brittany, Normandy, Loire Rhone, Alps, Provence, Côte d'Azur	

EUROPEAN COLLOQUIUM "CAL FOR EUROPE" *

ENSCHEDE, 25 - 28 May 1986

Twente Technical College

Report by Mr. Han Van GESSEL.

*CAL : Computer-Assisted Learning

EAO : Enseignement Assisteé par Ordinateur

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Introduction

* To what extent is cooperation between the member states of the European Community desirable and possible in the field of the development of educational courseware and software? This was the main theme of the EEC Conference entitled 'CAL for Europe' which was held from 26-28 May 1986 at the Twente University of Technology in Enschede, the Netherlands. The Conference was organised by the Dutch Ministry of Education and Science in conjunction with the Applied Education Department and the Centre for Education and Information (COI) of the Twente University of Technology.

* The conference was part of a series of conferences held since 1983 under the auspices of the EEC to achieve a regular exchange of ideas and experience regarding the introduction of the computer in education. Previous conferences have been held in Marseilles (1983), Newcastle (1984), Bologna (1985) and West Berlin (1985). The conferences are designed primarily for people involved in policy-making in relation to the problem, such as government officials, education inspectors and teacher trainers.

* The title of the conference, 'CAL for Europe', indicated the two-pronged nature of its approach. On the one hand, the intention was to review within an EEC framework the progress made to date with the introduction of Computer Assisted Learning (CAL) in the different sectors of education. In particular, attention focused on the development and production of educational courseware and software. On the other hand, the title represented a clear call to the member states of the EEC to achieve productive cooperation.

* The development of educational courseware and software forms one of the most important problem areas as regards the introduction of computers in education. In numerous EEC countries the computer is becoming an increasingly attractive aid in

schools. As a result of government measures and private initiatives, more and more schools have computers at their disposal. But the simple fact that the schools have their own computers does not guarantee that they are using them efficiently. For this to happen, two conditions must be satisfied.

* First, teachers must be properly re-trained. If they have not been taught properly in advance how to use computers effectively in their lessons, and if they are not aware of both the potential and the limitations of information technology, they will soon put the computers back in the cupboard, without ever having used them. The experience with the introduction of audiovisual media in education shows that if computers are going to be used successfully in education, teachers must be properly equipped to integrate the new media into their methods and teaching techniques.

* Second, teachers must be able to call on good educational courseware and software, geared to the specific needs of their pupils. First and foremost this means products with a sound educational basis. The market is currently swamped with all kinds of games and with drill and practice programs and while they can be a useful way of introducing computer assisted learning in a first phase, ultimately they are inadequate in didactic and educational terms. Professionally developed software is essential to create a permanent place for computers in education.

* All the member states of the European Community agree that there is a lack of good educational courseware and software. This is a major obstacle to the further development of computer assisted learning. Many schools have computers and are working hard to train their teachers but they do not have enough software to function effectively. Many teachers are therefore developing their own software and as a result, everyone is re-inventing the wheel. Teachers cannot or do not want to wait until the

professional developers of educational courseware and software produce their products. Moreover, it is often not clear to the schools what they can expect within a reasonable period of time from the government and/or educational publishers.

* The danger inherent in this situation is that know-how is wasted and quality is fragmented. Cooperation both national and international would therefore be an appropriate policy here and would affect all the people involved in introducing and shaping computer-assisted education; government, inspectors, teacher-trainers, teachers' organisations, computer manufacturers and educational publishers. The necessity of creating a place for computers in schools is recognised by virtually everyone. We must ensure that this is a meaningful place with good prospects for the future.

* In his opening speech to the conference, the Dutch State Secretary for Education, Gerhard van Leyenhorst, said on behalf of the Dutch Minister of Education, Wim Deetman, that education has a key role to play in developments in society in the field of information technology. He argued that as a result of rapid developments, there was a danger that people would be split into two groups in the future: those who understand information technology and those who do not.

'Education is particularly suited to preventing this type of split', Mr van Leyenhorst said. ' It is not merely a national duty, it is a European duty to prevent this situation from developing. Consensus undoubtedly exists on paper as far as this is concerned, but the real crux of the matter and of finding a solution to it lies in developing and implementing a specific policy to this end. This is certainly a job for education or education and science ministers. It is also a job for many other policy-makers and officials within government and education.

* The EEC delegate, Mr. D. Lenarduzzi, in his opening speech emphasized the need for European cooperation on information technology and software development. For a number of years the EEC commission has implemented an action programme to stimulate and coordinate activities in the member states. This is primarily intended to prevent fragmentation. 'We are striving to achieve greater communication between member states in this field', Mr Lenarduzzi said.

* He went on to say that in practice the introduction of computers in schools often makes life in schools more difficult rather than easier. This is not simply because of problems with the hardware but mainly because of the software. Europe is still dependent in many respects on the United States for example. 'We should attempt to develop our own EEC products in order to strengthen our own market position, naturally, whilst retaining the cultural differences between the member states. A child in Sicily needs different things to a child in Denmark or the Netherlands.'

* In three days the 'CAL in Europe' conference examined how attempts to achieve greater cooperation within the EEC can be converted from a verbal declaration of intent to an effective policy. After a presentation of Dutch initiatives in the field of computers in education, four speeches were made in which the problems were outlined in a logical sequence.

* Margaret Cox, director of the Educational Computing Section of King's College, London, reviewed the current state of computer assisted education and prospects for the future. Jef Moonen, Director of the Education and Information Technology Centre in Enschede then outlined the problems in relation to developing educational courseware and software. Andre Poly, the director of the Euriclee Centre in Paris, then gave an account of the problems relating to the production of educational courseware and software. Finally, David Walker, Director of the Scottish

Micro-Electronics Programme in Glasgow gave an account of the international aspects of educational courseware and software.

* In addition to the main speeches, working parties, which reported on their discussions at the end, also discussed the conference theme. The working parties consisted of delegates with the same occupations: government officials, education inspectors and heads of schools, software developers and teacher trainers. More than 100 delegates enjoyed the balmy spring weather and the magnificent setting of the Twente University of Technology in Enschede. At the end of the conference everyone agreed it had been a tremendous success.

Section 1

The plan to stimulate information technology in the Netherlands

* In 1984, the Dutch government presented a plan to stimulate the introduction of information technology. This was the first major government policy document designed to produce a cohesive policy regarding the introduction of computer assisted learning in schools. For 1984-88, 1.7 billion guilders has been set aside to implement the plan; approximately 270 million guilders has been specifically reserved for education.

* The plan to stimulate information technology groups activities under four headings: education, research, industry and government. The objective is that within five to ten years, all pupils will be taught to use computers with a view to subsequent occupations, participation in society or their own personal development. With this in mind, numerous projects and activities have already begun in a variety of sectors.

* During the conference, Kas van Deursen, Head of the Education and Information Technology Project Group at the Dutch Ministry of Education and Science explained a number of aspects of the plan to stimulate information technology. He pointed out the special nature of the innovation strategy in the plan. Unlike normal practice in the Netherlands, the activities have, he said been developed, without the help of educational institutions and with little feedback from educationalists. Instead, use has been made of the expertise of experts from other sectors of society such as industry.

* This approach was necessary in order to bridge the gap which had come into being in the 1970s between education and other sectors of society. Mr. Van Deursen drew a comparison with the fairy tale of the Sleeping Beauty. "In the 1970s, education in

the Netherlands was so pre-occupied with its own ideals and problems that it seemed to be losing contact with the rapid social, economic and technical changes taking place within society. Information technology is the prince who brings the sleeping beauty to life with a kiss and builds a bridge between education and the real world outside school.'

* Mr. Van Deursen said that in the early 1980s, a growing need emerged for clearly-defined government policy on information technology. The plan to stimulate information technology is the result. Three ministries were responsible for drawing up the plan: the Ministry of Economic Affairs, the Ministry of Agriculture and Fisheries and the Ministry of Education and Science. The Minister of Education acted as coordinator of the plan which can be regarded as a large-scale manoeuvre to enable the Netherlands to catch up with the latest developments in technology.

* Within the framework of the plan, five types of activities are being developed for education. They consist of:

- developing an infrastructure for the development and distribution of courseware and software.
- specific projects in the various sectors of education. Considerable attention will be devoted to introducing information technology into the curriculum during the first two years of secondary education. The other main emphasis will be on strengthening vocational education.
- in-service training of teachers
- the introduction of information technology in all teacher-training courses
- research into the possible uses of computers in education.

As part of the practical implementation of the plan to stimulate computer science in 1985, the Minister of Education entered into an agreement with three computer manufacturers - IBM, Philips and Compudata - to introduce information technology throughout the secondary education system. Before the end of 1988, all 3 companies will supply all 2250 schools in the first stage of secondary education with a network of one teacher's computer and eight pupils' computers. The companies will also help with training courses for teachers, the development of educational software and the creation of computer rooms. The intention is that by the end of 1988, every school will have at least three specially trained teachers, one of whom will be a woman. All the schools will receive a one-off grant from the Ministry of Education to purchase good educational software.

* Mr. Van Deursen said that the development of educational software is the key problem in relation to the introduction of information technology in education. It is the Achilles heel of the whole operation. If the schools do not have good software at their disposal, the whole plan will collapse. There are many snags as far as the development of software is concerned. Mr Van Deursen said the main problems were:

- the high cost;
- the difficult technical aspects of the development process;
- gearing the content of the software to the curriculum;
- the complex educational/political context, with the requirement of freedom of education, no government intervention in the policies of educational publishers and no centralised quality control;
- the absence of expertise in relation to software in education and conversely, the absence of educational expertise among software developers;
- the gulf between the universities, which have the expertise, and primary and secondary education.

According to Mr. van Deursen, the educational world is now ready for the introduction of information technology. Teachers will be glad to help with its further development, but they must be reassured that computers will provide them with genuine help in their daily teaching and that they will have good materials at their disposal. The latter will only be possible, Mr. van Deursen concluded, if there is European cooperation in the field of teacher training and the development and dissemination of educational courseware and software.

Section 2

CAL and the future

* The introduction of Computer Assisted Learning (CAL) in the next five to ten years will ensure that our schools can respond to the rapidly changing industrial and commercial needs of the EEC countries. If CAL is properly prepared and implemented in schools we shall be able to make a great leap forward in educating our children for the future.

* This was the conclusion of Margaret Cox, Director of the Educational Computing Unit of King's College London, in an enthusiastic account of the possible uses of CAL in education in the future. However, she warned against having excessively high expectations. Before the EEC countries introduce CAL in their schools on a large scale, they would do well to make use of the experience of CAL in various countries in the past 15 years.

* In England, she said, CAL occupies a more or less permanent place in primary and secondary education. Primary schools - for children aged 5 - 11 -- have on average 1 micro-computer per 100 pupils. All schools have at least 2 teachers with the necessary know-how regarding computers. Secondary schools - for children aged 11- 18 - have one microcomputer per 100 pupils. Here, too, every school has at least 2 teachers with the necessary expertise.

* Despite this fairly positive situation as regards the availability of computers, the actual use of CAL in lessons is still limited compared with traditional teaching aids such as books and blackboard and chalk. When CAL is used it is often for drill-and-practice parts of the syllabus as might be expected. This is closely connected with what teachers are most familiar with.

* Teachers and pupils often react positively to CAL for a variety of reasons. First, various studies have shown that if CAL is used properly, it can considerably motivate children. CAL makes it possible to develop learning activities which go further than traditional methods. And finally, there is a good deal of agreement about the fact that CAL is an invaluable way of introducing children to computers, with which they will come into close contact in the future.

* However, there are problems. Partly because of the lack of funds, many schools do not have sufficient hardware and software. It is often difficult to persuade teachers to change their teaching methods to accommodate CAL in their lessons. Sometimes there is also a lack of confidence in the value of CAL in education. And possibly the greatest obstacle to the introduction of CAL is the fact that computer programs do not link-up sufficiently as yet with the syllabus and the curriculum.

* Margaret Cox said that heads of schools have a key role to play in relation to the successful introduction of CAL in schools. Much depends on carefully considered educational policies on the part of heads of schools. Without proper management, it will be virtually impossible to allow teachers to respond to the opportunities created by CAL. Training courses for teachers will also have to be organised at the regional level to ensure that CAL becomes an integral part of teaching in schools on a permanent basis.

* She went on to say that as far as the next few years are concerned, good educational software and training courses for teachers are essential. As far as software is concerned, various types of programs can be used in schools:

Drill and practice programs

In these programs everything the pupil needs to learn is in the computer's memory. The pupil answers a question and the computer says whether the answer is right or wrong. This is the easiest type of software to develop and the easiest for teachers to use.

Simulation programs

These are open-ended learning processes. The computer guides the pupil on his or her voyage of discovery through the syllabus. This type of software is only suitable for certain disciplines and subjects.

Framework programs

This software is not based on a particular model, but is itself designed to create and construct models. It allows the individual teacher a great degree of freedom based on his or her own views. This is the most difficult type of software to develop and the most difficult type for teachers to use.

* Hardware is also developing rapidly. More and more manufacturers are using the same system with the result that software programs can be used on different types of machines. The capacity of microcomputers is being enlarged from 8-bit to 16-bit and upwards. Colour is being used as well as black and white. Computers can now display drawings and graphics as well as text. They can be operated either by a keyboard or a mouse.

* Margaret Cox emphasised that teachers must be properly trained and instructed if CAL is to be successfully introduced in schools. This means that, in the next few years, a great deal of attention will have be to paid to creating a climate in the schools where the arrival of computers is regarded as a meaningful form of educational innovation. Teachers must come to realise that computers can make a valuable contribution to the quality of education.

* CAL must also be integrated within the organisation of schools. CAL has consequences for the layout of classrooms, the allocation of funds, the organisation of examinations and the

relationship between various subjects. It is also important to involve pupils in the introduction of CAL. 'Pupils are too often forgotten' Margaret Cox said, 'but it is vitally important that they too should have a say'.

* According to Margaret Cox the following pre-conditions must be met if there is to be any chance of successfully introducing CAL in the years ahead:

- headmasters must play the role of pioneers:
- the curriculum will have to be revised;
- the whole teaching staff must be retrained;
- sufficient finance must be organised;
- help must be offered on a long term basis.

* Margaret Cox concluded her remarks by forecasting developments in the next ten years. She said she expected that by about 1995, every school would have one microcomputer per 10 pupils and 100 software programs. By that date, the curriculum will have been changed by about 40 per cent. Courses for teachers will also be considerably expanded both during teacher-training and in the schools.

Section 3

The development of educational software

* The introduction of Computer Assisted Learning (CAL) will only yield permanent results if CAL has a positive and substantial effect on education. Such an effect can only be achieved by using proper pedagogic and didactic software. A carefully delineated and consistent strategy is necessary to ensure the successful development of good educational courseware and software.

* This was the main theme of the remarks by Jef Moonen, Director of the Education and Information Technology Centre at Twente University of Technology who gave a brisk and detailed account of the problems affecting the development of educational software. He dealt mainly with the first stages of the development process: developing ideas and trial products. The production of software was dealt with later by Andre Poly (see section 4).

* So far the development of educational software has mainly been in the hands of individual teachers or groups of developers. The individual teachers largely consist of enthusiastic amateurs whose hobby consists of spending enormous amounts of time and energy developing their own programs. Once they have finished they are often disappointed because the results are less than they expected. Their work is not recognised and there is little prospect of a follow-up.

* The majority of programs which have come into being in this way are not suitable for general use in education. In fact, Mr Moonen argued, something must be done to stop this type of software development. It involves such a massive waste of enthusiasm, energy, creativity, time and money that it should be a major objective of national policy to discourage it and to incorporate individual enthusiasm into a more worthwhile approach.

* The problem with programs developed by individuals is that they can only be used in the school where the teacher has developed the program. Its success or failure depends on the enthusiasm of its creator. This approach should be regarded as a historically necessary stage, but gradually everyone will have to realise that no one person can be a specialist in all development areas: creative impulses, pedagogic design and technical design.

* Working with groups of developers is a much better approach. Several teams can then be responsible for the various stages such as initial planning, educational design and technical application. If small groups of experts are involved at every stage of the development process, the quality of the final result will be much better than that of a strictly individual approach.

* However the team approach is not without its problems, Mr Moonen said. For example, communication between educational designers and technical designers is a major problem. They speak a different 'language' and really do not understand the other's problems. Educationalists often have an inadequate knowledge of the problems of technical programming. Conversely, technical staff often have insufficient knowledge of the learning process.

Mr. Moonen: 'Although it is extremely important to form a cohesive team of experts to work out the educational design, in practice it is difficult to achieve complete agreement on design. It is also noticeable in this situation that there is a marked shortage of professional designers. Even experienced teachers have the greatest difficulty in producing an original educational design. Whilst a broad experience of education is regarded as necessary for a good designer, we have also discovered that experience by itself is not enough.'

The team approach combines almost all the essential elements needed to develop and produce good educational software, according to Mr Moonen. But one essential element is missing: a compelling economic construction. So far educational software has been developed as part of special projects where the main criterion is to see how software can be used in education. Economic arguments play virtually no role here. So far the development of software has not been organised as a commercial activity.

* And yet, Mr. Moonen argued, software must be developed on economic principles if CAL is to be successfully introduced on a large scale in schools. This is difficult enough as it is. Production must be tackled more professionally. The price must be reasonable. The software must not date too quickly.

* These problems complicate the production of educational courseware and software, certainly for educational publishers working on a commercial basis. They have to invest large sums of money in development before they earn a single penny. Because of this dilemma many publishers are not prepared to commit themselves and are unwilling to embark on large-scale production. Mr Moonen said that in his view, initiatives needed to be developed to make the development and production of educational software commercially attractive.

* He went on to say that the development and production of educational software must be raised to an industrial level, by adopting the following measures:

1. A project approach must be used consisting of teams working under a strong project management. The most important aim of this approach is to keep a close watch on development costs and to keep them as low as possible.

2. The usefulness and life expectancy of courseware and software must be increased, for example by making semi-products which can be adapted by teachers to their

own situations with 'teacher tool kits'. These consist of a package of routines specially developed for certain programs.

3. A clear distinction must be made between the various stages of the production process. The first stage will consist of developing experimental programs produced by specialist institutes such as universities. The second phase will involve working out the pedagogic design in detail. Finally, the third and last stage will consist of industrial production.

4. The financing of the various stages must be organised. In principal this could involve national governments and educational publishers. If the government pays, then it will also have a decisive role to play in determining which courseware and software goes to the schools. This could create problems in a situation where the schools are free to choose their own methods. If commercial organisations are asked to foot the bill, the likelihood is that nothing will happen in view of the high cost of the first two phases. Mr. Moonen said a two-tier construction could resolve the problem: government should pay for the first two stages of development, and industry the third stage. 'By making this arrangement', he said ' commercial organisations will not have to undertake a large amount of expensive research and development work. At the same time the government will not become involved in an activity which is normally the preserve of industry, namely the production of teaching materials.'

Mr. Moonen concluded that clear choices will have to be made if a professional development and production process is to be achieved. The choices apply to the following areas (his 'top five'):

1. individual approach versus team approach.
2. three distinct stages: experimental programs, prototypes, commercial products.
3. increasing efficiency by using the most efficient hardware and software at every stage.
4. increasing the life expectancy of software products, for example by introducing a 'teacher tool kit'.
5. stimulating activities to obtain more educational technicians, designers and project managers.

Section 4

The production of educational software

* The way in which the production of educational software is organised and the problems in this area *formed the main* themes of the remarks by Andre Poly, Director of the Euriclee Centre in Paris, who described the situation in France.

* The production of educational software started on an experimental basis in the late 1960s and really got underway in the early 1970s. From that time onwards the major companies with a national computer network available to them, filled in the gaps which existed in the use of their computer services with software. Their products were copied and distributed in a way which resembled experimental research rather than genuine commercial exploitation.

* We can only really speak of a market when all schools have computers. Only then can the production of educational software also get underway. This situation developed in France in the 1981-1983 period. The creation of the market was facilitated by the reduction in the number of different types of computers used in schools. This now means that some programs can be produced in large numbers making production commercially viable. In 1985, more than 25,000 copies were produced of ten titles, three thousand being necessary to cover costs.

* In 1986, two types of market can be distinguished in France, each with its own way of operating. On the one hand there is the industrial and commercial market consisting of independent concerns which produce software for both commercial institutions and private individuals. On the other, there is the state market which produces and purchases exclusively for its own schools.

* Schools can obtain educational software in four ways:

- Free cases of software. Every school which is supplied with computers receives a case of software, half of which consist of educational programs, thirty per cent of professional programs and twenty per cent of games or programs which combine learning and playing.
- Vouchers. Each school receives a voucher which the teachers can use to choose their own software from a list of seven hundred titles. This system gives teachers a large degree of freedom to choose the software they want.
- Unrestricted purchase from their own funds from government organisations or educational publishers.
- Products made available free of charge by the Centre National de Documentation Pédagogique i.e. experiments where very small number or highly specialised subjects are involved.

The market is increasingly tending to favour open-ended software, where teachers can input their own data and software where the user can intervene to change the content and the organisation of the program. For 1986, an educational publisher has announced that it will be investing a large amount of money in setting up a research and development team to develop modern educational software. At the same time, the government has declared that good educational software should be developed by the state.

* To begin with, educational software was largely devised by individual teachers who converted any educational material suitable for computer use into software. Slowly but surely this situation has made way for a production approach in which five types of expert are involved; teachers/educationalists, scientific advisers, media experts, technical producers and publishers. In practice, a distinction can be made between three types of production scheme:

- a teacher/educationalist submits an idea to a publisher which is then worked out and tested by the publisher's media/computer team;

- a publisher provides a teacher/educationalist with technical help and the teacher/educationalist then develops a prototype which the publisher can develop further;
- a publisher selects the educational ideas which are financially viable and signs contracts to have them produced.

* Commercial organisations base production of a program on sales of at least three thousand copies. Average production costs for ordinary software are estimated at 100 to 200 thousand French francs. Open-ended software can cost as much as several million francs. The Centre National de Documentation Pedagogique, which is a government body, sells its products at one third of cost. It therefore finances the entire development process up to and including the actual prototype.

* The distribution of software is a problem. Just like when they are buying school text books, teachers first like to see a review copy before buying a program for their school. This means that places have to exist where teachers can have the opportunity to look at programs. Commercial publishers need to take this into account.

* There are various ways in which teachers can familiarise themselves with the educational software which is available:
- there is a national educational software library with all existing titles and 35 different machines for the purpose of inspecting software;
- a special service (DIDACTEL) supplies a list of programs which can be viewed on screen; every title has several screens which describe how the program works and its strengths and weaknesses;
- all the products of the Centre National can be viewed in in regional or departmental software libraries;
- a special magazine publication which is sent to all educational institutions;
- education representatives go to schools and institutions with a case containing all available programs.

* Illegal copying - software piracy - is a problem which cannot be eliminated in relation to the production of educational software. Mr Poly said that a small program is copied between four and ten times. The publishers have announced that they will not attempt to protect software costing less than one hundred French francs. Otherwise the cost involved in protecting

programs would destroy their pricing policy. They regard it as acceptable that a program will be copied once for back-up purposes and that other teachers in a school will also copy it for their own use.

* Legal action is needed to combat the trade in copying and tips on how copies can be made. It is generally accepted that high-quality software supplied with attractive documentation at a low price should not be copied. An aggressive sales policy where software is available in large numbers of outlets can also help counteract the most harmful effects of piracy. Many people, Mr. Poly said, speak of 'moral education' of the consumer in this connection.

* Mr. Poly concluded his remarks by saying that the production of educational software is largely dependent on three factors:

1. The academic and educational quality of the prototype;
2. A sufficiently large market to make production profitable;
3. New techniques so that software can be used in an international framework and so that it can be distributed quickly and efficiently.

Section 5

EEC cooperation and the development of educational software

Cooperation between the member states of the EEC on the development of educational software is an exciting prospect. The exchange of ideas and experience can only work to the advantage of students and teachers. International activities can provide an important stimulus for computer companies and manufacturers of educational software in EEC countries. But is cooperation possible ? And what would it involve in practical terms ?

* This was the theme of the enthusiastic talk by David Walker, Director of the Scottish Micro Electronics Development Programme, laced with numerous witty comments. Although clearly in favour of greater international cooperation as regards the development and production of educational software, as a sober Scot, he kept both feet firmly on the ground. International cooperation, he said, is terrific, but we should not lose sight of political and commercial limitations which exist whether we like them or not.

* Many countries have started with plans and programs to introduce new information technology in education, according to Mr. Walker. Of course, they vary considerably from country to country, depending on the economic, political and cultural context. The differences lie in the nature of the approach of the country concerned and do not in essence affect the educational starting points. They tend rather to influence how plans and programmes are set up and how quickly they are introduced.

* Educationally speaking, there are strong arguments in favour of encouraging an international programme to exchange experience, but there are also strong technical and economic justifications for such a course of action. It is unlikely that a single country can do everything by itself to keep pace with

developments. Things are happening too rapidly and are not confined to a single location. Cooperation within the EEC is an attractive way of making optimal use of financial resources and knowhow.

If cooperation of the type envisaged is to be achieved, software must be compatible. The EEC countries taken as a whole have the best educational software which meets the demands of both students and teachers. However, the software has been designed for numerous different computer systems, not all of which have been developed within the EEC. Often the systems do not speak the same language so that the software is not compatible.

* Moreover, some manufacturers pursue policies aimed at restricting the exchange of software between their own models of microcomputers. As a result, a situation has developed in numerous areas where the wheel is having to be re-invented. Furthermore, funds are constantly being made available for technological aspects when it would be much better to spend the money on the development of more effective models for using information technology in education.

* At the moment, each of the EEC countries is going its own way as regards the development and introduction of information technology in schools. One country decides on a centralised approach while another adopts a completely different strategy. Pooling experience and resources would mean that the EEC would have a clear lead as regards educational courseware and software. In order to do this, a structure must be devised within which educationalists can work together and exchange software models without being hampered by the limitations of the technology.

* David Walker suggested that international cooperation could take place at the following levels:

- the development of educational software;
- the development of educational aids;
- the context of development systems;
- the system in the classroom.

* He proposed that an EEC project should be set up entitled 'European New Information Technology Development Environment' (ENDE) so that experts from all of the EEC countries can exchange experience and develop new cooperation initiatives. The project would involve:

- setting up a European team of educationalists to give ENDE practical form;
- attempting to agree on a common operating system, based on an existing commercial system but capable of being adapted to the needs of education;
- participation in ENDE does not mean making a choice of a microcomputer; every country will retain the right to decide which type of microcomputer it wishes to use in schools;
- developing a common technical development language which can increase the compatibility of software;
- developing an effective storage system through which individual schools can have access to software.

Although the ENDE project is intended in the first instance to provide support for the schools, it will inevitably contribute to strengthening the European hardware industry. At the moment, many European countries import microcomputers from outside the EEC, particularly from the United States. The ENDE project could make a significant contribution towards changing this situation. All of the European countries could develop software which concentrates on educational aspects rather than on technology. All of the software could be used on all the microcomputers manufactured in the EEC.

* Mr. Walker suggested that a small working party should be set up to gauge the feasibility of ENDE in the different EEC countries. The working party could also start looking at the plans against the background of existing limitations and financial resources. Some EEC countries have already made funds available to stimulate their information technology programmes. One of the first actions of the working party could consist of organising a number of meetings with key figures from the EEC countries to discuss possible operational models.

* The project can only succeed if it has a full-time director. Too often projects fail because their most important participants have to carry out duties in the limited time they have available in addition to their normal workload. A project like ENDE which is important and wide-ranging should not be subjected to this kind of constraint.
* The composition of the project team will be dependent on what eventually emerges as the object and structure of the project. Two or more observers should at any event be involved, first to represent education and also to monitor management and fieldwork. Their duties would mainly consist of making recommendations and supervision.

* A project team must be supported by representatives of the participating countries. Participation of a minimum of five countries is necessary to ensure cooperation and objectivity. Each ember state of the EEC can set up a national working party to advise and support the central project team. As far as reporting is concerned, it would be advisable to report once every four months and to have a substantial review every twelve months at an annual conference.

Section 6

The development of educational software in discussion

* During the 'CAL for Europe' conference, the theme of the conference - the development of educational courseware and software and the possibilities of achieving international cooperation - was discussed after every speech by five small working parties. The working parties were composed of people with the same occupation: two groups consisted of government officials, one of inspectors and heads of schools, one of teacher-trainers and one of producers of educational software. At the end of the conference, there was a forum session with the four speakers, chaired by the conference chairman, Professor Tjeerd Plomp, professor of applied education at Twente University of Technology.

* The main topics discussed were:

- The development of educational software and the teacher
- The problems affecting the development of educational software
- The need for international cooperation.

* Now that the initial stage of introducing information technology in schools in many countries is over, it is becoming increasingly apparent that the classroom teacher has a key role to play in ensuring the success or failure of Computer Assisted Learning. It is up to the teacher whether CAL is given a proper place within educational activities as a whole. Moreover the teacher is a an indispensable figure in introducing new elements into the curriculum to link up with the development of educational software.

* At the same time as educational software is being developed, attention must also be paid to the practical opportunities in schools and the preparation required as part of in-service

training and teacher-training. Heads of school have an important role to play as regards stimulating developments. They must ensure that teaching staff remain enthusiastic in the face of countless unavoidable disappointments. Necessary adjustments as regards the organisation of school activities and the use of the building must also be made with or without help from government.

* The introduction of information technology in schools must go hand in hand with revision of the curriculum. On this point all of the delegates to 'CAL for Europe' agreed. The problem is not so much making sure the schools have computers. Numerous companies are currently offering computers to schools at very attractive prices. The biggest problem along with developing educational software is equipping teachers so that CAL can be integrated into schools in a flexible manner.

* Adequate training and retraining of teachers is therefore an absolute pre-requisite for the introduction of information technology in schools. At the same time, attempts must be made to ensure that teachers can contribute to the development of educational software. If new educational software is being developed, teachers must be involved from the outset. They can play an important role in developing ideas for software and in evaluating software on the basis of pedagogic and didactic criteria.

As far as the development and production of educational software is concerned, it became clear during the conference that there is a great need for standardisation of machines and models within an EEC framework. At the moment, major differences exist between the various countries. As a result, a situation has developed where the wheel is being re-invented in numerous places at the same time. Standardisation and international cooperation at all levels of the development and production process will increase the life expectancy of educational software and the ability to exchange it.

* In this context, the remarks by M. van Dalen, director of the Kluwer Group (Netherlands) of Educational Publishers were extremely interesting. He pointed out that the development of good and durable educational software has been hampered by the rapid succession of computer models accompanied by significant price reductions. No publisher will contemplate developing software in the knowledge that it is going to be obsolete or unusable within the foreseeable future. Computer systems must be standardised, he said, so that educational publishers can be assured that their software will last at least as long as traditional products, that is to say from three to six years.

* Each country has its own preferences regarding the organisation of the development and production of educational software. Some countries favour a model in which one person is responsible for development from the first idea up to and including the manufacture of a prototype. Others prefer a model in which a team of experts supervise development at all stages. The various countries all have their own preferences as regards financing.

* Despite the differences there is a great need for international cooperation on the development and production of educational software. This would mainly involve exchanging ideas and views on education, evaluation criteria, open-ended software and development tools. Cooperation is also desirable on the production and distribution of educational software, including co-financing and cooperation between educational publishers. International cooperation can also make a contribution towards solving the copyright problem.

* The form which cooperation within the EEC assumes is a separate issue. One of the working parties urged that a small team of experts should be set up to direct projects and activities

relating to international cooperation. The team would reflect the political and cultural variety among members states. The money spent to date on conferences such as 'CAL for Europe' would be spent in the future on cooperation projects.

* International cooperation is chiefly desirable so that governments and educational publishers are financially and commercially in a position to supply schools with educational software. Small countries such as the Netherlands face the additional problem that the development and production of software in the language of the country will often far exceed the income it can generate. Countries with greater distribution potential such as Britain, Germany and France suffer much less form this problem.

* It was recommended that educationalists in each of the EEC countries should undertake a special study of the educational usefulness of CAL in order to provide international data which could contribute to establishing priorities. It was also felt that, within the framework of the EEC, agreement should be reached concerning quality criteria, which could form a guideline for evaluating educational software. The same applies to meetings of production teams.

* In the closing session of the forum it was noted that international cooperation on teaching resources is a relatively new phenomenon. Virtually no consideration has ever been given to international cooperation on text books since each country has its own educational philosophy on publishing books for the various subjects and teaching areas. But the introduction of CAL heralds an educational revolution. The content of education changes, the role of teachers changes as does the organisation of the school itself. It therefore makes sense to listen to each other's opinions and to profit from one another's experience. The introduction of information technology in education is a development which extends beyond national frontiers.

Section 7

Final conclusions

At the end of the conference, Kas van Deursen, Jef Moonen and Tjeerd Plomp summarized the main conclusions which were as follows:

1. The delegates to the conference were unequivocally in favour of international cooperation and wished to do all they could to make it possible. At least two reasons can be advanced to justify international cooperation:
   - international cooperation raises the value of the individual efforts of each country; and
   - international cooperation has a positive effect on the costs involved.

As far as international cooperation is concerned, certain aspects should be emphasized. First, cooperation will never be compulsory. Every member of the EEC is free to join a project. Second, the products which result from cooperation projects must be available to all of the countries concerned. Moreover, the projects must be based on the realistic relationship between means available and expected results.

2. The participants agreed that supportive finance from national governments is necessary to develop educational courseware and software. This relates primarily to the current position vis-a-vis the development of educational software and the characteristics of the education market.

3. Broad political support is necessary for activities which aim to solve problems connected with the development of educational software and reaping the benefits of the process in the education system as a whole. If the support is not given, the activities in question are doomed to fail.

4. Priorities must be established. It is not possible to do everything at once. In view of the general shortage of finance and the situation as regards the development of educational software, to begin with one or two carefully selected projects should be launched.

The chairman closed the conference by recommending, on the basis of the discussions, that four types of EEC cooperation projects should be instituted:

1. Projects leading to the establishment of guidelines and recommendations regarding the technical aspects of the development process.
2. Meetings of teachers to produce ideas as to how information technology can best be used in all the different subjects and syllabuses.
3. Projects in the field of production of educational courseware and software based on technical guidelines and educational brainstorming. These can best be arranged by two or more countries which are at a similar stage of development as regards information technology.
4. Exchange of products and experience resulting from cooperation projects. The means to achieve this include workshops, summer courses, mini conferences, reports and brochures.

Mr Van Deursen concluding his closing remarks as follows: 'In the Netherlands we build our homes on piles. Together they form the foundations. The four types of projects which have just been mentioned represent the foundations on which a programme of cooperation can be constructed. We hope that the European Community will be in a position to build this programme for 1987-1988. The setting up of a small EEC project team could be an important first step in this direction.'

University summer course on educational software

- Gent 1986 -

1. PREPARATION AND PROCEDURES OF THE SUMMER UNIVERSITY

1.1_Motives_and_aims

The Summer Universities of the European Community are built around the topic "New Information Technologies in Education". The first, Nice, France, july 3 to 13, 1984 dealt with "Applicative languages in education". The computer science aspect of these languages was stressed.
The second, Liège, Belgium, july 4 to 13, 1985 dealt with "New information technologies and primary school". The educational aspect of software was stressed for the particular age-group 5 to 14. During this university the need was felt to entirely devote the third Summer University to the modalities of use of software. Indeed, whatever the educational value of a software package can be, its true value depends on the teacher and the student. The methods used by the teacher and the objectives he pursues with a software package are of paramount importance. Therefore the general theme was chosen as follows:

"ANALYSIS,MODALITIES OF USE, INTEGRATION IN TEACHER TRAINING AND PROCESS EVALUATION STRATEGIES, WHEN INTRODUCING COMPUTER SOFTWARE IN EDUCATIONAL PERSPECTIVE."

This general theme was further split into four important subthemes:

(1) Analysis and description of educational software in European perspective.

In order to discuss modalities of use of computer software a careful, complete analysis and description is needed. It should be worthwhile to make a description document during the university which could be used by all the EURYCLEE centres of the Community.

(2) Modalities of use

- With the same software different objectives can be pursued. Which are the appropriate teaching strategies and the teacher-intended learning strategies used by the learner ?
- Organisational modalities inside the school: time-schedule, number of computers....

(3) Integration of software in school-practice: preservice and inservice teacher training.

Teacher training is here restricted to the integration of software in school-practice. The purpose is to avoid a general discussion about teacher training.

(4) Process evaluation of the introduction of software in educational situations.

- Follow up
- Scientific support offered by research centres.

Foregoing paragraphs and others below are quotations from the introduction papers of SU-86. They will be indicated by double quotes. These introduction papers contained three parts:
(I) Preparation and procedure of the SU-86,
(II) Some questions related to the themes of the SU-86 and
(III) General introduction on the themes.

Parts II and III gave more elaborated information about the different subthemes of the Summer University. These papers were distributed to all participants six weeks before the S.U. started. Over 50 papers coming from the participants were distributed during the S.U.. They consisted of 20 presentations of a more general matter, and 36 project descriptions or demonstrations. The total input of the S.U. thus consisted of the introduction papers and the contributions of the participants. The output, as intended by the organisors, was the preparation of a discussion document to broaden the specific points of the topics submitted in the introduction papers such that points of view, comments, examples, projects, evaluation designs existing in the member states of the E.C. should be reflected in the final document.

1.2. Participants and location

As participation at the Summer University was only by invitation, administrators of the Commission of the European Communities and two professors of the state universities of Liège and Gent in Belgium, which are both responsible for Experimental Education, asked the national officials responsible for the introduction of NIT's in education and other persons from the member states, to make proposals for candidates. The candidates' profile was described as follows:
- they are or researchers at university or non-university research centres or fieldworkers participating in research.
- they know educational software and have a good experience in using them in educational situations.

On this basis of information given by the informants 30 candidates were selected. To foster cooperation between the member states the organisors also invited the directors of Euryclee centres of the E.C.

The 40 participants from Belgium (4 researchers), Denmark (3), Federal Republic of Germany (3), France (5), Greece (2), Ireland (4), Italy (2), Luxembourg (1), Netherlands (3), Portugal (5), Spain (3) and from United Kingdom (5) made the S.U. an E.C.-forum of discussion. The participants can be characterised as educationalists by profession whereas a minority could be described as belonging to the scientific computer community.

The S.U. took place at the "Seminarie en laboratorium voor Experimentele, Psychologische en Sociale Pedagogiek", State University of Gent, July 8 to 15, 1986. It was a stimulating experience with presentations, demonstrations, lively discussions and an interesting and constructive output (cf. part 3 of this report).

1.3. Procedure of the S.U.

The S.U. started on tuesday, july 8 and had its closing session on tuesday, july 15. Three types of activities could be discerned:
(1) plenary sessions about one of the four subthemes were mostly scheduled in the morning (4 on theme 1, 5 on 2, 7 on 3 and 4 on 4);
(2) projects and demonstrations worked in parallel on the four subthemes (7 on theme 1, 16 on 2, 8 on 3 and 5 on 4) - these were scheduled in the afternoon from 14:00 to 16:00. The presentations in these plenary and parallel sessions varied in length and relatedness to the subthemes. Most presentations were followed by vivid discussions;
(3) four working groups, one on each subtheme, met in parallel on wednesday, thursday, saturday and monday from 16:30 to 18:00. Their task was described in four points: delimitate key-problems of the theme, discuss these, make conclusions and give recommendations to the E.C.. Each working group consisted of a chairman, four reporters and participants. Reporters had to minute on all the activities in relation to the theme for which they were responsible. They received abstracts from all speakers for plenary and parallel sessions and had to complete these abstracts with reports of the discussions of these sessions and of the working groups. A reporting room with text processing systems was at their disposal in the conference building and in the residence place of the participants. Chairmen of the working groups were D.C. Pereira from Portugal (group 1), F.S. Pedersen from Denmark (group 2), P. Mc Kenna from Ireland (group 3) and A.C. Thomson from Scotland (group 4).

2. THE THEMES OF THE SUMMER UNIVERSITY

In this part of the report, more detailed information will be given on the themes dealt with during the S.U.. In her welcoming address G. Schuyten broadly described the objectives as follows:

(1) to produce a description system of software which could be used in the Euryclee Centres

(2) to share findings concerning experiences of modalities of software use

(3) to conceptualize a core program for teacher training concerning these modalities of use

(4) to detect strategies which are effective in the evaluation of the process of introducing N.I.T. in schools.

2.1. Theme 1: Analysis and description of educational software in European perspective.

The S.U.-86-introduction papers already contained an excellent paper with bibliographic notes of M. Valcke. The abstract of theme 1 was stated as follows:

> "The relevance of descriptive systems for educational software is unquestionable. In looking for relevant descriptive categories, two specific descriptive dimensions are discussed in more detail: objectives and teaching and learning strategies."

It continues:

> "The relevance of analysing existing software is hardly questionable. Lewis (1983, p.82) points e.g. the importance of such a description through the provision of teacher's guides: 'So often, CAL material is misunderstood, and considered valueless, simply because the authors fail to communicate their ideas and rationale to potential users.' But elaborating an analysis of educational software, relevant for educational practice is not that easy. The analysis is expected to result in an instrument, easy to be used and understood by teachers. Moreover, this description is to be useful for people of the different countries of the European Community. This description is not to be compared to existing checklists, which are mainly intended to evaluate the software program. Evaluation is not of main concern in relation to this topic.
> Nevertheless, some evaluation checklists do contain certain parts about 'description'.
> Another problem, when analysing software, is the potential flexible (thus adaptable and different) use of some educational programs. Certain packages give opportunities to be used in a variety of ways. Categorizing them is hardly possible.
> This concern, to develop a descriptive system, can be approached by looking for answers to two questions:
> 1) Who is expected to elaborate these descriptions ?
> 2) What will be the content of this description ?"

A more detailed discussion about existing descriptions is given in the paper. This paper was preceded by key-questions focusing on content, users, informants and relevance. These were meant as an aid to orientate the discussions for the working group. Eleven presentations were given concerning this theme. During the activities of theme 1 a lot of description systems used were looked at (f.i. Belgium, Italy, France, Netherlands, ...). It was suggested that the different existing systems should be tested in the E.C.-member states.

A remarquable point of view was given by M. Yazdani of Exeter University. He argued that neither the computer, nor the program is important, but the programmer's prejudice, assumption and preconceptions are. Computer software, in his view, should be objective free. They are developing at Exeter "shells", general-purpose tools, containing no tutoring strategy - it is up to the individual teacher to decide on the modularity of use. Following Mr. Yazdani 'the way software is used is dependent on his architecture; multi-purpose educational software is possible, if we support a freedom of education where individual teachers and individual pupils can choose what application they use the software for'.

After two meetings of the working group, one agreed that the analysis would take the form of a three-part entry: (1) technical details, (2) description (in the form of a standardised checklist filled in by publishers, authors or others), (3) review and/or evaluation. As the registration of technical details seemed obvious to the group and the review and evaluation were discussed in groups 2 an 4, the members redefined their task to find a good way of describing educational software.
They managed to produce a catalogue / checklist at the end of the S.U.. The headings of this list are (existing in english and french):

1. GENERAL DESCRIPTION

   1.1. Identification
   1.2. Population, aims, content
   1.3. Delivery source
   1.4. Documentation

2. TECHNICAL CHARACTERISTICS

   2.1. Hardware requirements
   2.2. Interaction
   2.3. Adaptability / Portability
   2.4. Control of performance

3. EDUCATIONAL FRAMEWORK

   3.1. Educational objectives
   3.2. Educational advantages
   3.3. Educational strategy
   3.4. Student activities
   3.5. Guidance and feedback for students
   3.6. Guidance and feedback for teachers
   3.7. Quality control
   3.8. Educational setting

4. COMPLEMENTARY

   4.1. Experimental reports
   4.2. User reports
   4.3. Evaluation report
   4.4. Bibliographical references
   4.5. Write a descriptive slogan

It has been argued that this catalogue / database should have openings to other databases.

Due to an intervention of D. Ballini the discussion concentrated on the precise meaning of the terms and headings used in the catalogue. It was stressed that the definition (if existing) of certain concepts in the same language is not unique, so what about translation problems ?
Indeed, if the participants agreed to take with them the checklist to test it in their country, a glossary was highly needed. At the end of the S.U.-86 a glossary of 28 words was given to the organisors in the nine languages of the E.C.. This glossary is a starting document to open broader discussions on the terminology used in the member states of the E.C. and in their Euryclee centres.

Another problem tackled by this group was that people will use the description with different objectives (purposes). Obviously, the information wanted by a teacher, a student, a parent, a researcher, a manufacturer is different. So the group discussed about how software information, contained in the database could be dissiminated to various target groups such as: (1) teachers-educators, (2)informatics specialists and programmers, (3) administrators. It was argued that "very few if any require all the information available, but many need concise, accurate sub-lists to meet their specific requirements."

An interesting idea was put forward by D. Ballini by constructing for several headings "un système d'emboîtage du style des poupées russes". Subsets of the checklist-set should be available for each target group.

A fourth problem which received a lot of attention, concerned the question already mentionned in the introduction papers: "Who is expected to elaborate these descriptions ?"

The group agreed that the checklist must cater for a varied response from different groups such as publishers, researchers and evaluation groups. The members of the group were asked to compile a list of questions which the publishers of the software would have to answer as part of the entry requirements for the software in the catalogue. A list of questions to publishers was delivered at the end of the S.U.-86

The fifth output produced by the working group consisted of answers to the questions in the introduction papers. The questions centered around content, users, informats and relevance for the E.C.. Concerning the content, users and informants reference is made to the catalogue. It was generally agreed that no specific taxonomy should be used in describing the objectives and that the checklist should be supplemented with other lists of learning materials as video-disks, robotic add-ons etc. to be used in the future by teachers. Concerning the relevance for E.C.-members it is proposed to have available for Euryclee centres two databases: (1) with general information for all member countries and (2) with specific information related to the local situation. Help is asked to the E.C. to continue "the process of upgrading through a series of further meetings after this initial launch."

At last, the report of this group goes as follows (translated from french):

> "The working group is well aware that the output, even if it is interesting, is only a step which need concrete upgrading. The next steps are:
> (1) a user's guide for filling in the checklist
> (2) dissimination of the catalogue to all directors of Euryclee centres.
> (3) construction of a common data base with the help of Eurydice for dissiminating the information and the help of Eudiset for the problems of terminology."

The group asked the E.C. for concrete actions to make this work possible.

2.2. Theme 2: modalities of use of software

As already mentionned under 1.1. this was the starting theme to which the other ones were added. The abstract of theme 2 in the S.U.-86 Introduction papers is as follows:

> "Integrated use of software affects a lot of parameters of the classroom-system. Among these parameters, the teaching and learning strategies are of main importance when discussing the extension of the educational relevance of software packages."

It continues:

> "Writing an introductory text in relation to this second theme of the Summer University is not that easy, since we do not find enough elaborated research data about the actual use of computer programs. Most literature, reporting experiences when using software, gives limited descriptive information, some general comments, some evaluative considerations, ... but we hardly find an in-depth analysis of the use of educational software. We especially lack information about the adopted teaching strategies and the organisational context in which the program is used.
> The topic 'modalities of relevant use' can be approached in two different ways, each one depending on whether a structural or a content-bound line approach is adopted. At the content-level, especially the specific teaching and learning strategies are important. Questions emerge in relation to the pupil's and teacher's activities that are most likely to be adapted.
> At the structural level, we have organisational questions in mind. Although these organisational questions are very interesting, we focus most of our attention in this introductory text to the content-level."

A discussion with bibliographic notes is then given concerning organisational problems and teaching and learning strategies. Eight key-questions preceded this paper.

The large numbers of presentations, 20, given in this theme, tell us that this is really the theme 'in focus' at this moment. The large number of projects / demonstrations, 15, reflect the amount of work which is going on in the classrooms of the E.C.-member states. During the activities of theme 2 a lot of interesting and enhancing demonstrations of software packages were given. Let me just mention the work done by ITMA, represented by D. Benzie who demonstrated that the computer, suppoSted by suitable software, becomes a third personality in the class, and the presentation about 'Logowriter' by M. Valcke, to my knowledge a primer in conferences in Europe.

The output of the working group of theme 2 consists of 8 pages with 6 headings: (1) introduction, (2) general educational model, (3) the place of the computer in the model, (4) different functions of the computer, (5) modalities of use on the micro and macro level, (6) recommendations.

The introduction of their report is as follows:

> " In the context of education the use of a software tool is influenced by a lot of factors, variables, ... And since these factors or variables can have different 'values' or belong to a larger set of alternatives, the actual use of a piece of software can be quite different from one educational setting to another.
> Moreover, since an educational setting is a dynamical situation, rapidly changing and adapting to specific needs or demands, one can never talk of THE use of a software tool because this use will consequently vary in relation to the changes in the setting.

> As such, modalities of use are entirely determined by the 'variables or factors' and by their interaction.
>
> In this discussion document, the outcome of the close collaboration between participants of theme 2, the main focus is on the detection of these 'variables and factors'. But during the discussions, it was not always easy to direct all attention to this aim or to stay within the topic.
>
> Some participants felt for instance that the 'computer' got too much attention. A typical example is the criticism of the T(eacher)-P(upil)-C(omputer) model to describe an educational setting in which computers are used. In relation to this model there was a general tendency to replace the C of computer by the K of Knowledge or the O of Objectives. This overall concern about the educational aspects of computer use in classrooms resulted in preliminary reflections on a descriptive model for an educational setting in which computers are being used. And of course, since this setting cannot differ largely from other settings in which media, methods, tools are used, also the model won't be that different from general methods to describe educational settings.
>
> It's only after agreeing on this model that the next step could be taken in relation to the topic."

In (2) a general triangular educational model with the key-elements T(eacher) - P(upils) and K(nowledge) is elaborated. The report continues:

> "Bringing in resources in this model changes the triangle into a tetraeder. Their - potentially variable flexible - use depends entirely on decisions or characteristics in relation to the three components."

Schematic representations for poor tutorials, word processing as a tool, databases (design and inquiry), David's bottles and discovery with LOGO are given using this model.

> "Since not only the position of the computer can vary in relation to the three main components of the general educational model, also the function of the computer can vary."

A list is added grouped around focusing on mastery of contents (11 functions), focusing on production, focusing on exploration and focusing on the job.
A possible taxonomy of classroom functions is proposed, followed by some illustrations on the micro and macro level.

At last the recommendations by this working group are given in full extension.

> "(1) We recommend that the commission should encourage the publication of case studies giving details of actual lessons where computer based materials have made a significant and worthwhile contribution. This can include extensive descriptions of different uses of the same software package.
>
> (2) At another level, also research, reporting and communication is important related to psycho-pedagogical matters. Especially the methodology of the observation strategies and evaluation procedures is of prime importance. In this way, the focus is on the actual USE of software tool.
>
> (3) There was a large demand for organising more opportunities for an ongoing exchange of experiences, regarding the use of software in education.

(4) Provisions for the study of multi-media learning environments (including for instance interactive video) in general education.

(5) Facilitate exchange of experts in the development of educational software so that community expertise can be shared and flexible uses of software tools are enriched by good quality tools.

(6) Facilitate exchange of teacher trainers at primary and secondary level in order to learn from each other previous and ongoing experiences.

(7) In order to enhance the possibilities to explore a wide variety of good quality software, there is a large need for organising at the European level a kind of institute that centralises or facilitates the exchange of software. At the very moment protectionist attitudes or publishing restrictions, ... inhibit the free distribution and interchange of software tools.

(8) Moreover, in addition to the former statement, there is also a need for research on the description of types and uses of educational software. However, such an effort may be waisted if there is no provision of funds by the Commission to implement these standards."

2.3. Theme 3: Integration of software in school-practice: preservice and inservice teacher training

The abstract of theme 3 in the S.U.-86 introduction papers is as follows:

> "Current teacher training is criticized, since it is mostly oriented towards 'general awareness' or 'technical' introductions to computers. This third theme asks for more specific kinds of teacher training in which teachers acquire necessary 'knowledge' and 'skills' to use the software in an integrated way."

It continues:

> "It sounds rather unnecessary to repeat that the integration of instructional computing in the current teaching practice is the Achilles' heel of educational computer use (Neufeld, 1981, p.359). But the implications of this approach to instructional computing are important. This approach puts forward questions about curriculum change, changes in classroom structure, support structures, teacher training, ... Especially answering the latter question needs a lot of priority."

And further:

> "Since the themes of this Summer University pay a lot of attention to (1) the description and (2) the implementation of computer software, we especially await teacher training to contribute to these topics. Some INSET (IN SErvice Training) courses in Great Britain, include training objectives, related to these themes, e.g.: 'Establish a number of standards in the CBL domain which can be interpreted and applied by the subject teachers when considering the use of CBL material in the classroom' (MEP, 1982, p.43).

> But, also in relation to these INSET courses, we could not find enough concrete data, to illustrate possible realisations about skills-oriented teacher training courses."

Nine key-questions preceded this introduction. Fourteen presentations were devoted to this theme; seven in plenary and seven in parallel sessions. After preliminary, rather confuse discussions, the working group of this theme decided to retain three problem areas:

(1) The methods, strategies and contents of in-service teacher training which are common in all member states

(2) factors making teacher training sessions successfull

(3) the motivation of teachers to take part in teacher training sessions.

In the report of the group, three general objectifs are mentionned: (1) the teacher is able to transmit a "general computer culture", (2) the teacher is able to give an education to their students concerning the new information technologies materials, (3) the teacher is able to use software as a support for teaching and learning.
For each objective the contents and methods are indicated. It was argued that teachers should be introduced to software through applications which are of most benefit to them such as: (1) through the use of wordprocessing for their course notes, (2) through listings of examination results and (3) through management of information on a database. This should be done through presentations, observation, analysis and experience.

At last the recommendations by this working group are given in full extension:

> " All recommendations relating to the implementation of teacher education in the new information technologies assume that optimum use will be made of technical and personnel resources. This requires that a dynamic synergy be established and maintained between the formation of teachers, the development of software and its standardisation and the provision and standardisation of hardware.
>
> Action is urgently required to train the educators of teachers in the new information technologies so that some formation be given to teachers.
>
> This could be facilitated by teaching staff exchanges with industrial trainers in other EC countries under the COMET programme.
>
> **1. Euryclee directors should notify teacher training institutions of COMET, forward them application forms, and suggest collaborators where possible.**
> **Researchers experienced in the new technologies from ESPRIT or DOCDEL projects could be invited to assist in the education of teacher educators.**
>
> **2. Euryclee directors make available a registry of researchers engaged in ESPRIT, DOCDEL, CODEST or other information technology project to those responsible for the education of teacher educators.**

Pre-service students should be encouraged to seek courses in the new information technologies in EC countries where experience is similar to more advanced than in their own country under the ERASMUS programme when it becomes available.

3. Euryclee directors inform authorities in pre-service and in-service institutions about the ERASMUS programme and supply details of countries/institutions which might be approached for collaboration.
Trainers/researchers involved in advanced information technologies on the DELTA project be drawn on to highlight the future evolution of technologies for the teacher educators.

4. Euryclee directors circulate teacher training institutions with details of the research being undertaken in the DELTA project and the names of researchers responsible for it.

5. Particular attention be given to current and potential applications of the new information technologies to the education of the handicapped.

6. The European Commission actively supports the role of the Euryclee centres in achieving co-ordination in the development of educational materials in the new information technologies within the community. They should aim at avoiding duplication of effort in the development of materials and should ensure that the best material is available across member states of the european community. Their main activities should include:

a. making information on the new information technologies materials available to schools and teacher training institutions within the EC;
b. seeking agreement on standards for educational software between agencies within the EC;
c. commissioning work, such as the conversion of materials in the (different) laguages of the EC.

7. The European Community part-fund and encourage national representatives and institutions to make available resources to teachers involved in the new information technologies, so that they can obtain the hardware and software necessary for their personal and professional development.

2.4. Theme 4: Process evaluation of the introduction of software in educational situations

The abstract of theme 4 in the S.U.-86 introduction papers is as follows:

> "In relation to evaluation, a lot can be learned from earlier research. Evaluation is in this theme of the S.U., related to decision making. Several types of evaluation are discussed. Alternatives for 'effects' research are elaborated."

It continues with a discussion, together with bibliographic notes, about (1) evaluative data - some basic considerations, (2) types of evaluation and (3) some examples.

Concerning the evaluative data it is underlined that

> "A striking fact in this field is the limited amount of research data. With Walker (1983, p.42) we have e.g. to state that, despite the enormous scale of experimentation in computer-based education, the flood of new journals and the predictions of a sensational revolution in learning and teaching, the actual quantity of evaluative data - trustworthy and accessible - is small.
>
> And secondly, there is lot of suspicion of the quality of most research. Decision-making evaluative research is mostly narrowed down to research into 'effects'. Papert's well-known rejection of this type of research is quiet, representative in this discussion (Papert, 1973, p.34)."

Two different approaches to the evaluation are discussed: (1) the comparative experimental approach (pre-test / post-test design) and (2) the feedback formative evaluation approach. Although the second approach is more suited for process evaluation, rejecting all kinds of experimental evaluative research is too extreme. It is also stated that process evaluation can include:

> "- Collection of descriptive data about 'what' is going on in the educational field.
> - Case studies of individual projects on the use of software packages.
> - Gathering information about the reactions (of all those involved) on individual software packages.
> - Analysis of student differences in use of the new medium.
> - Inventories of equipment.
> - Reviews of funding policies.
> - Measurement of social impact.
> - Collecting data about alternative uses of software packages.
> - ......

Seven key questions preceded this introduction.

Four plenary and four parallel sessions were devoted to theme four. The report of this working group starts as follows:

> " This theme involved discussions of the evaluation of the process of the introduction of Information Technology in education, with particular emphasis on computer software. It was recognised that the theme was not primarily concerned with the process of evaluation of educational software itself. At the same time the whole area was felt to be so complex that it would be found to be useful, for the purposes of providing context, to consider specific software evaluation processes from time to time."

During the sessions of this group answers were given to nine questions arisen at the start of the discussion. These are:

(1) For what purpose is evaluation undertaken ?
(2) Who organises the evaluation ?
(3) Who does the evaluation ?
(4) How should results be communicated ?
(5) How should materials be evaluated ?
(6) What types of evaluative approaches can be adopted ?
(7) What types of data should be collected ?
(8) What types of data are relevant for decision makers ?
(9) What can be learned from instructional media research ?

Concerning question 5 three levels of evaluation were indicated: (1) practical (evaluation of actual use of the software in the classroom), (2) subject content (performed by experts), (3) theoretical (evaluation of the learning strategies).

Together with these levels, types of software and modalities of use were added, thus resulting in a three-dimensional grid with the three dimensions: (1) level of evaluation, (2) type of software, (3) modality of use. It is noted that 'more work needs to be done to work out this idea further'.
Concerning question 6, the group recognised that there exists a tendency in large scale evaluation exercises to achieve a consensus report on the software. They stipulated that this type of report would not be of practical value, and evaluators should therefore strive to make quite clear the effectiveness or ineffectiveness of the software in given situations.
Concerning question 8 the report reads as follows:

> " It is realised that it will be difficult to provide data for decision makers, as often their prime criteria are financial rather than educational. The experience gained in using media over the past twenty years leads us to conclude that the introduction of new information technology does not always, in the short term, lead to less expensive education. On the other hand, evaluators should be able to provide data which indicates cost-benefit rather than cost-effectiveness. Education is not a free product in the open market, and should not be measured purely in financial terms. The introduction of computers in education should be measured in terms of improvement in quality and not simply by means of cost analysis.

And at last the conclusion:

> " Finally, it was noted that this theme was by far the least-populated in terms of workshop participants, demonstrations and projects, and this reflects the difficulty and complexity of the topic. Very little work has been done in this area, and not much evidence has been produced, nor is there much published evidence that the theory is being translated into practice. There is a need for work to be undertaken to gather together research findings in this field, in the same way as has been done for other media in the past. The group would have liked to have had enough time to produce a full proposal along these lines but this was not possible.
>
> It is therefore recommended that EEC invite projects for funded research along these lines so that more awareness of the process of the introduction of new information technologies can be shared within Member States."

3. OUTCOME OF THE SUMMER UNIVERSITY 1986

Two publications will be available. First the 'Introduction papers' consisting of four parts: (1) Preparation and procedure of the S.U.-86, (2) Some questions related to the themes of S.U.-86, (3) General introduction to the themes and (4) a list of participants of the S.U.-86.
Late '86 the proceedings will be published containing the introduction papers, abstracts from the presentations and the reports of the four working groups.

4. FINAL REMARKS

Looking back at the Summer University 86 some major issues can be identified.

The procedures used and the quality of the introduction papers were excellent. The output would have been more fruitfull if these papers were distributed earlier to the participants. More time in preparing the Summer University is needed such that participants have more information about each other before the meeting. The 2 days needed now for getting acquainted with each other could therefore be eliminated. The S.U. has not only to be a meeting place for individuals sharing ideas and experiences but also it has to be a working place where a kind of 'collective brain' is working i.e. building up a E.C.-culture in new information technologies in education.

After three S.U.'s our database about people and institutes involved with N.I.T. in education in the twelve member states, give us a good idea about the state of the act in the E.C.. After three S.U.'s with general themes, time has come to organise S.U.'s of 3 or 4 days long with one specific, well defined and restricted topic. The existing database can give information for determining the topic and the participants.

It should be a waste of time and money if the hard work done by all participants would be without continuation. In the recommendations given by the working groups a lot of suggestions are given with regard to the collaboration between the S.U. and other E.C.-actions.

G. Schuyten

Organisor of S.U.-86.

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